

Functional Equivalence for National Environmental Policy Act (NEPA) and EPA's Cumulative Effects Requirement

The National Environmental Policy Act 42 U.S.C. §§ 4321, et seq. ("NEPA") requires all federal agencies, including EPA, unless specifically exempted by statute, to take a "hard look" at the environmental impacts from all major federal actions. NEPA "prevent[s] or eliminate[s] damage to the environment and biosphere by focusing government and public attention on the environmental effects of proposed agency action." Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 371 (1989).

NEPA requires that federal agencies fully consider all direct, indirect, and cumulative environmental impacts of the proposed action. 40 C.F.R. §§1502.16; 1508.8; 1508.25(c). Direct effects are caused by the action and occur at the same time and place as the proposed project. §1508.8(a). Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. §1508.8(b). Id. Cumulative impacts are: "[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." §1508.7. For instance, for mining operations, the agency must fully review the impacts from off-site ore or waste processing and transportation. South Fork Band Council of W. Shoshone of Nev. v. U.S. Dep't of the Interior, 588 F.3d 718, 725 (9th Cir. 2009). Similarly, because impacts of the federal and state governments' foreseeable failure to ensure radioactive waste disposal facilities for past, present and future ISL projects could require wastes to be "stored on site [...] on a permanent basis," NEPA requires that the action agency "must assess the potential environmental effects of such a failure." New York v. NRC, 681 F.3d 471, 479 (2012).

Federal courts have dealt squarely with situations where a federal agency "says that cumulative impacts from non-Federal actions need not be analyzed because the Federal government cannot control them. That interpretation is inconsistent with 40 C.F.R. § 1508.7, which specifically requires such analysis." Center for Biological Diversity v. NHTSA, 508 F.3d 508, 517 (9th Cir. 2007). For example, an agency was required to consider the impacts of power turbines in Mexico in their EIS reviewing a U.S. transmission line because the projects were "two links in the same chain." Border Power Plant Working Group v. Dep't of Energy, 260 F. Supp. 2d 997, 1016 (S.D. Cal. 2003).

The EPA maintains a somewhat special status with regard to NEPA. Federal courts have allowed EPA to forgo strict and formal compliance with NEPA under a doctrine labeled "functional equivalence." The term "functional equivalent" was coined by the D.C. Circuit in Portland Cement Assoc. v. Ruckelshaus, 486 F.2d 375 (1973), cert. denied 417 U.S. 921 (1974). Its requirements can be concisely summarized:

The functional equivalency test provides that, where a federal agency is engaged primarily in an examination of environmental questions, and where substantive and

procedural standards ensure full and adequate consideration of environmental issues, then formal compliance with NEPA is not necessary, [and] functional compliance [is] * * * sufficient.

Warren County v. North Carolina, 528 F. Supp. 276, 286 (E.D. N.C. 1981).

The central requirement of the functional equivalence test is that the Agency's procedures provide for the same consideration of diverse environmental issues as required by NEPA. In International Harvester Co. v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1993), the court said that:

we see little need in requiring a NEPA statement from an agency whose *raison d'être* is the protection of the environment and whose decision ... is necessarily infused with the environmental consideration so pertinent to Congress in designing the statutory framework of NEPA. To require a "statement", in addition to a decision setting forth the same considerations, would be a legalism carried to the extreme.

478 F.2d at 650, n. 30. Thus, according to the federal courts, as interpreted by the Environmental Appeals Board, "functional equivalence could be present in cases where the statute mandated 'orderly consideration of diverse environmental factors,' rather than the five specific NEPA-EIS elements. Amoco Oil Co. v. EPA, 501 F.2d 722, 750 (D.C. Cir. 1974)." In re: Phelps Dodge Corporation, Verde Valley Ranch Development, 10 E.A.D. 460 (May 21, 2002).

Importantly, the SDWA does not exempt EPA's UIC program from NEPA. Rather, for EPA's UIC permits issued under the SDWA, EPA regulations provide that "all [UIC] permits are not subject to the environmental impact statement provisions of ... [NEPA]." 40 C.F.R. § 129.9(b)(6). As described, the basis for a regulatory exemption from NEPA, as opposed to statutory exemption, is the "orderly consideration of diverse environmental factors" in the same manner required by NEPA. In re: Phelps Dodge Corporation, Verde Valley Ranch Development, 10 E.A.D. 460 (May 21, 2002). One aspect of this required "orderly consideration of diverse environmental factors" is embodied in the EPA regulations providing that, for area Class III UIC permits, such as that at issue here, EPA must evaluate "[t]he cumulative effects of drilling and operation of additional injection wells...." 40 C.F.R. § 144.33(c)(3). In other words, EPA enjoys no automatic exemption from NEPA, and the regulations confirm that the question of compliance with NEPA's cumulative effects analysis mandate must be found in the EPA documents offered to meet NEPA's "twin aims" - informed decisionmakers and public involvement. *Baltimore Gas & Electric Co. v. Natural Resources Defense Council, Inc.*, 462 U.S. 87 (1983),

In the present permitting exercise, EPA has not met the applicable standard. In other cases where the EAB has upheld an EPA cumulative effects analysis, it found that the agency had considered a diverse range of environmental impacts. For instance, in In re Avenal Power Center, LLC, 15 E.A.D. 384 (EAB 2011), the Board upheld an EPA cumulative effects analysis in the air pollution context because:

Agency provided an extensive discussion of the various projects and mitigation strategies underway in the area surrounding the proposed facility that are intended to mitigate the impacts of multiple existing sources on the communities located in close proximity to the proposed facility. *See* Response to Comments at 83-85. Specifically, the Agency determined that based on the types of environmental conditions already present in the area surrounding the proposed facility, the Agency believed these conditions would be more effectively addressed through actions that the Agency can take in conjunction with state and local governments. *See id.* (discussing mitigation strategies including, but not limited to, enforcement actions against a local hazardous waste facility, addressing nonattainment pollutants through the ongoing state and local air quality planning process, and issuing administrative compliance orders to address local violations of the Safe Drinking Water Act).

Id., slip. op. at 15. This type of analysis is not presented in this case, and EPA's Response to Comments do not contain the type of detail necessary to demonstrate compliance with the cumulative effects review requirements.

The 2019 Draft Cumulative Effects Analysis of the Dewey-Burdock Uranium In-Situ Recovery Underground Injection Control Area Permits fails to account for all of the cumulative impacts of the project. For instance, the company has recently released documents that demonstrate a planned expansion of the disturbed area from the project. See attached Map included in the applicant's December 2018 press release (Attachment 1) compared to the attached Map from the 2014 NRC Final Supplemental Environmental Impact Statement (Attachment 2). The company has even more recently proposed an increase in the amount of uranium ore it proposes mine from the property in a December 4, 2019 press release. See attached Azarga December 4, 2019 press release (Attachment 3). Unfortunately, the company appears to not be releasing the actual technical report accompanying the December 4, 2019 announcement for an additional 45 days. EPA should pause the public comment period and/or reopen that period based on the new maps and data being withheld by the company until after the close of public comment. Otherwise, EPA staff and the public are left without the necessary opportunity to analyze and comment on the expanded project Azarga has publicly announced, in violation of EPA regulations. See 40 C.F.R. § 124.11. In any case, the expanded mining area requires an updated analysis, for which additional EPA analysis must be conducted to meet SDWA and NEPA mandates, followed by public comment and review that must be provided to meet NEPA's requirement that the scope of analysis correspond with the scope of the proposal.

The cumulative effects analysis also fails to adequately discuss or review the cumulative effects associated with the transport of radioactive byproduct waste material to the White Mesa Mill in Utah. While the documents acknowledges White Mesa as the destination for the waste and includes waste disposal transport in its analysis of local truck traffic air impacts, the document does not review the associated impacts associated with such things as inevitable spills or the associated cumulative impacts at the White Mesa Mill, which has experienced and continues to experience significant problems – as detailed in the Tribe's 2017 comments to EPA. Significant environmental justice issues are presented by a project involving radioactive waste impacts in that disproportionately impact Native American Tribes' interests and their members' interests in

the Black Hills and in the Four Corners region (e.g. Ute Mt. Ute, Hopi, and Navajo) where Energy Fuel's White Mesa disposal facility is located.

The storage capacity at White Mesa mill, if used up by others processing and disposal streams, will result in a default on-site disposal until a disposal site is identified and secured. Basically, the same sorry state of affairs that plagues reactor wastes. The licensed-disposal capacity of the White Mesa cells is a valuable (albeit toxic) commodity. A proper cumulative impacts analysis may reveal that the disposal capacity required for existing ISL licensees/UIC permittees exceeds existing (and planned) disposal capacity. EPA's cumulative effects analysis must address this issue.

The cumulative effects analysis also fails to account for other projects not just in and around the Black Hills, which cumulatively impact the Tribe culturally and spiritually, but also additional projects proposed in close proximity to the Dewey-Burdock property. For instance, Powertech has proposed opening satellite mines, including in the Dewey Terrace area, that would feed the processing facilities at the Dewey-Burdock site. Indeed, the company is on record specifically stating that the Dewey Terrace project is proposed as "a nearby satellite project, within 10 miles of the Dewey Burdock Project, the Company's initial development priority." See attached Azarga press release dated October 31, 2017 (Attachment 4). This project is in addition to others, such as the Aladdin and Savageton project the company promotes. The impact of these satellite mines must be incorporated into the cumulative effects analysis.

Azarga/Powertech has long admitted that the Dewey-Burdock facility is proposed to be used as a processing site for ongoing uranium mineral development in the region, even identifying specific projects that would provide future feed the Burdock regional processing/milling facility:

It is likely that the CPP at the Burdock site will continue to operate for several years following the decommissioning of the Proposed Action well fields. The CPP may continue to process uranium from other ISL projects such as the nearby Powertech (USA) satellite ISL projects of Aladdin and Dewey Terrace planned in Wyoming, as well as possible tolling arrangements with other operators.

See attached Dewey-Burdock Project Application for NRC Uranium Recovery License Fall River and Custer Counties South Dakota Technical Report (excerpt) at page 1-8 (Attachment 5); see also Powertech (USA) Inc. Dewey-Burdock Project Class III Underground Injection Control Permit Application at page 10-14 (Attachment 6).

Powertech has specifically asserted that future processing of ore from the Aladdin and Dewey Terrace facilities are part of the "Proposed Action" included in the Dewey-Burdock license application:

It is likely that the CPP at the Burdock site will continue to operate for several years following the D&D of the project well fields. The Proposed Action is for the plant to continue to receive and process uranium loaded resins from other Proposed Projects such as Powertech's nearby Aladdin and Dewey Terrace Proposed Satellite Facility Projects planned in Wyoming or from other licensed ISL operators or other licensed facilities

generating uranium-loaded resins that are compatible with the Powertech (USA) production process.

See attached Dewey-Burdock Project Application for NRC Uranium Recovery License Fall River and Custer Counties, South Dakota, Environmental Report, February 2009 (excerpt) at page 1-25 (Attachment 7). The handling of these foreseeable waste streams is not addressed, and there has not been an opportunity for public comment.

These foreseeable processing and tolling arrangements require a careful analysis of the actual effect of the EPA approval. It is foreseeable that the continuing processing could turn the Dewey-Burdock facility into a *de facto* waste facility, much as the White Mesa mill has transitioned from a uranium mill that rarely processes conventional ore into an alternate feed/ISL disposal facility. NRC, like EPA, has identified the use of a mill for disposal as potentially inviting “sham processing” and cannot ignore this foreseeable, and indeed espoused, aspect of the Azarga business plan. *In the Matter Of International Uranium (USA) Corporation* 51 N.R.C. 9, 2000 NRC LEXIS 21, (N.R.C. February 10, 2000).

Further, the mineral exploration and development activities around the Black Hills should be accounted for in the cumulative effects review, given the spiritual and cultural import Lakota people place on the Black Hills as a whole. For instance, publicly available records demonstrate oil and gas exploration/development operations in the direct vicinity of the proposed Dewey-Burdock project. See attached State of South Dakota approval in Case No. 5-2019 (Attachment 8). EPA must review this, and all similar, projects as part of the cumulative effects analysis. In addition, several gold mining companies are proposing mineral development projects on the east side of the Black Hills, particularly in the Rochford area, which is compounded by the long-standing contamination from the Homestake properties in the same area. Other mining development in and around the Black Hills region must be evaluated, including the Cameco operations in Nebraska and the proposed Bear Lodge rare earth minerals mine.

Also of concern with respect to cumulative effects are those associated with the Black Hills Ordnance Depot. Issues of soil and ground water contamination associated with this site are well documented. The cumulative impact analysis must address potential exacerbation of ground water contamination associated with chemicals from the Depot caused by the proposed Dewey-Burdock project, including ground water pumping both for mining purposes and for freshwater use, along with deep injection disposal.

Lastly, EPA’s cumulative effects analysis fails to discuss the past uranium mining on the Dewey-Burdock property, left unreclaimed, and the associated cumulative contamination potential from those mines. The Darrow/Freezeout/Triangle mines have been the subject of some review by EPA and are recognized as potential pollution sources to groundwater that simply must be accounted for in the cumulative effects review. See attached Preliminary Assessment of Darrow/Freezeout/Triangle mines (Attachment 9). These mines are but one potential pollution source that are contributing to contamination of the Cheyenne River. The Tribe has conducted sampling in the Cheyenne River downstream of the proposed Dewey-Burdock site and found elevated levels of contaminants, including uranium. See attached Cheyenne River sampling data (Attachment 10). EPA must review these, and all other, pollution sources to the Cheyenne

River, which may result in cumulative impacts to the water quality in the River when combined with the threats from the Dewey-Burdock project.

National Historic Preservation Act

The federal courts have addressed the strict mandates of the National Historic Preservation Act, 16 U.S.C. §§ 470, et seq.:

Under the NHPA, a federal agency must make a reasonable and good faith effort to identify historic properties, 36 C.F.R. § 800.4(b); determine whether identified properties are eligible for listing on the National Register based on criteria in 36 C.F.R. § 60.4; assess the effects of the undertaking on any eligible historic properties found, 36 C.F.R. §§ 800.4(c), 800.5, 800.9(a); determine whether the effect will be adverse, 36 C.F.R. §§ 800.5(c), 800.9(b); and avoid or mitigate any adverse effects, 36 C.F.R. §§ 800.8[c], 800.9(c). The [federal agency] must confer with the State Historic Preservation Officer (“SHPO”) and seek the approval of the Advisory Council on Historic Preservation (“Council”).

Muckleshoot Indian Tribe v. U.S. Forest Service, 177 F.3d 800, 805 (9th Cir. 1999). See also, 36 C.F.R. § 800.8(c)(1)(v)(agency must “[d]evelop in consultation with identified consulting parties alternatives and proposed measures that might avoid, minimize or mitigate any adverse effects of the undertaking on historic properties....”).

The Advisory Council on Historic Preservation (“ACHP”), the independent federal agency created by Congress to implement and enforce the NHPA, determines the methods for compliance with the NHPA’s requirements. See National Center for Preservation Law v. Landrieu, 496 F. Supp. 716, 742 (D.S.C.), *aff’d per curiam*, 635 F.2d 324 (4th Cir. 1980). The ACHP’s regulations “govern the implementation of Section 106,” not only for the Council itself, but for all other federal agencies. Id. See also National Trust for Historic Preservation v. U.S. Army Corps of Eng’rs, 552 F. Supp. 784, 790-91 (S.D. Ohio 1982).

NHPA § 106 (“Section 106”) requires federal agencies, prior to approving any “undertaking,” to “take into account the effect of the undertaking on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register.” 16 U.S.C. § 470(f). Section 106 applies to properties already listed in the National Register, as well as those properties that may be eligible for listing. See Pueblo of Sandia v. United States, 50 F.3d 856, 859 (10th Cir. 1995). Section 106 provides a mechanism by which governmental agencies may play an important role in “preserving, restoring, and maintaining the historic and cultural foundations of the nation.” 16 U.S.C. § 470.

If an undertaking is the type that “may affect” an eligible site, the agency must make a reasonable and good faith effort to seek information from consulting parties, other members of the public, and Native American tribes to identify historic properties in the area of potential

effect. 36 C.F.R. § 800.4(d)(2). See also, Pueblo of Sandia, 50 F.3d at 859-863 (agency failed to make reasonable and good faith effort to identify historic properties).

The NHPA also requires that federal agencies consult with any “Indian tribe ... that attaches religious and cultural significance” to the sites. 16 U.S.C. § 470(a)(d)(6)(B). Consultation must provide the tribe “a reasonable opportunity to identify its concerns about historic properties, advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, articulate its views on the undertaking’s effects on such properties, and participate in the resolution of adverse effects.” 36 C.F.R. § 800.2(c)(2)(ii). As such, the Tribe must be involved in all three of these efforts – 1) identifying historic or cultural resources; 2) evaluating impacts on historic or cultural resources and those resources’ eligibility for inclusion on the National Register of Historic Places (NRHP); and 3) developing project alternatives or mitigation measures to protect those resources that are or may be eligible.

The administrative record, including EPA’s draft decision documents and the EPA’s Response to Comments, fails to demonstrate that EPA complied with the consultation and historic resources protection requirements of the National Historic Preservation Act. Specifically, there has never been conducted a competent Lakota cultural resources survey of the Dewey-Burdock site. This has been the incontestable fact since the Nuclear Regulatory Commission’s Atomic Safety and Licensing Board (ASLB) issued its ruling in LBP-15-16 in 2015. *In The Matter of Powertech (USA), Inc. (Dewey-Burdock ISR Project)*, LBP-15-16, 81 NRC 618 (2015). This ruling has been repeatedly upheld by both the ASLB and the Nuclear Regulatory Commission itself. As such, without a competent cultural resources survey and analysis of the property, there is no way for the EPA to meaningfully consult with the Oglala Sioux Tribe – or any other Tribe – as to the identification, evaluation, or mitigation of impacts to those cultural resources. Given NRC Staff’s abject failure to meet its obligations to ensure a competent cultural resources survey and analysis, EPA is legally obligated to do so. The Tribe remains ready, willing, and able to assist in this effort – short of being asked to expend entirely its own resources to pay professional survey staff, as NRC Staff has wrongfully attempted to date. Given the ASLB’s ruling regarding the lack of identification of Lakota cultural resources, EPA cannot lawfully rely on its statement in the 2019 National Historic Preservation Act Draft Compliance and Review Document that:

Based on the information the EPA has reviewed to date, and subject to any further developments in the course of the NRC administrative review process, the EPA believes that the identification of historic properties completed under the auspices of the NRC through the Class III Cultural Resources Survey appears sufficient for the APE defined by the NRC.

EPA National Historic Preservation Act Draft Compliance and Review Document at 2.

EPA asserts that it continues to evaluate simply signing on to the Programmatic Agreement (PA) developed by NRC Staff in order to attempt to fulfill its NHPA duties. However, the lack of a competent cultural resources survey has poisoned the Programmatic Agreement such that it is not a viable means for NHPA compliance. Specifically, the PA was finalized in 2014 at the time

NRC Staff issued its Record of Decision for its licensure process for the project. As a fundamental basis for the PA, that document states in its recitals that “WHEREAS, surveys to identify historic properties have been completed for the project including Class III archaeological surveys and tribal surveys to identify properties of religious and cultural significance.” Final PA at 3 (Attachment 11). As discussed, this assertion is demonstrably false, as the ASLB subsequently found that NRC Staff had objectively failed to conduct any competent “surveys to identify properties of religious and cultural significance.” As such, the PA is not a lawful document for purposes EPA’s NHPA compliance.

Notably, the Tribe contests the EPA’s assumption of the Area of Potential Effect (APE) in the draft permitting documents. The APE appears to rely entirely on ground disturbance with an arbitrary buffer zone, but makes no effort to explain the basis for the limits of its “buffer zone” nor account for impacts to the cultural resources that may extend beyond the buffer zone. This speaks to the problems with proceeding toward permitting prior to having conducted a cultural resources survey and analysis. For instance, the Tribe believes that cultural resource sites present at the Dewey-Burdock property are significant for their ceremonial and/or spiritual values and purposes, which even if outside EPA’s buffer zone, could still be dramatically and negatively affected by the project. This is but one example, but demonstrates that these issues have not been sufficiently reviewed or analyzed in EPA’s draft permit documents. Further, as discussed herein, Powertech/Azarga has recently announced expansions of the projected disturbed area at the site, which do not appear to have been incorporated in any respect into EPA’s analysis.

In addition to the Section 106 NHPA duties, NHPA Section 110 imposes responsibilities on EPA to ensure a proper identification and evaluation of cultural resources. These duties cannot be dispensed with simply through attempts to contact the Tribe in the Section 106 consultation context. Further, NEPA imposes a separate but closely related set of duties on federal agencies when addressing cultural resources. NRC has found the EIS inadequate to meet NEPA’s statutory mandates, and EPA has made no serious effort to address these deficiencies – rendering EPA’s analysis legally deficient with respect to a cultural resource impacts analysis. While NRC Staff is currently attempting to escape its NEPA responsibilities – arguing that the cultural resources information is “unavailable”, the Tribe vigorously contests this argument. In any case, EPA may not rely on such arguments as NRC’s position in this regard is highly specific to its own administrative process, timing, and financial constraints.

ATTACHMENT 1

HAYWOOD

SECURITIES INC.

Member of the Canadian Investor Protection Fund

Azarga Uranium Corp. (AZZ-T, \$0.255)

Not Rated

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Dewey Burdock M&I Resources ↑97% as Prelude to Revised PEA in 2019

Event: Azarga Uranium announced a resource update for the Dewey Burdock ISR uranium project, South Dakota USA.

- **Azarga has grown the ISR-amenable 'all-categories' resource 47% at its Dewey Burdock project, with over 95% of project resources reporting to higher-certainty Measured & Indicated categories (Exhibit 1):**
 - Measured ISR resources increase 234% to 13.8 Mlb U₃O₈ (5.2 Mt grading 0.132% U₃O₈)
 - Measured and Indicated ISR resources increase 97% to 16.9 Mlb U₃O₈ (7.5 Mt grading 0.113% U₃O₈)
 - Combined M,I,+Inf. Resources increase 47% to 17.75 Mlb U₃O₈ (grading 0.11% U₃O₈) from 12.1 Mlb U₃O₈ (grading 0.11% U₃O₈). The new resource at Dewey is substantially larger, while average grade fell to about half of the prior resource but remains at the high-end of the typical U.S. ISR asset range.
- **Resource growth entirely within existing Nuclear Regulatory Commission (NRC) License boundary.** It is an important distinction that all of the tonnage outlined in today's resource update falls within Azarga's existing NRC license boundary and could confidently be integrated into an updated Preliminary Economic Assessment (PEA) of the project.
- **Larger resource should improve preliminary project economics.** We expect Azarga will likely integrate the new resources into a PEA update within H1/2019. As one of the highest-grade undeveloped ISR assets in the U.S., the 2015 PEA on Dewey demonstrated the potential for a low-cost 11-year mine producing ~1.0 Mlb U₃O₈ per year, with up-front CAPEX of just US\$27M, and cash costs of US\$12.53/lb (Exhibit 2). (PEA at US\$65/lb uranium, and 35% fed tax rate. The applicable fed tax rate has since been reduced to 21%, which is not reflected in the PEA).
- **Azarga well-positioned as a vehicle to take advantage of U.S. uranium boon.** Azarga controls a diverse asset base within the U.S. now including over 45 Mlb U₃O₈ in NI 43-101 resources in South Dakota, Wyoming and Colorado. **We are looking for companies controlling U.S.-based uranium assets to outperform non-U.S. peers over the next 4-6 months** with the expected catalyst being the outcome of the U.S. Department of Commerce investigation into domestic uranium supply due by mid-April 2019. We believe this investigation will likely lead to a favourable outcome for U.S. domestic uranium suppliers in terms of realized price. **Azarga's firm-specific catalysts (PEA, final licensing progress) line up well with this macro-catalyst.**
- **Permitting well advanced and path to clear final NRC License contention defined:** Dewey licensing/permitting is well advanced and Azarga's 'Source and By-product Materials Licence' from the NRC is in the final steps of resolving the final contention lodged with the Atomic Safety and Licensing Board (ASLB). Earlier this month the NRC was given two options by the ASLB to "expeditiously conclude" litigation of the final contention and the NRC will choose a path by November 30th. From there, we should have clarity on the process and timing. **Other required permits ahead of construction** include the U.S. EPA Underground Injection Control (UIC) permits (issued in Draft form in March 2017); and three State permits submitted (and deemed complete) to the South Dakota Department of Environment and Natural Resources [Groundwater Disposal Plan, Water Rights and Large-Scale Mine Plan permits].

Current Price \$0.26
YTD Performance 13.8%
Dividend / Yield \$N/A / N/A%

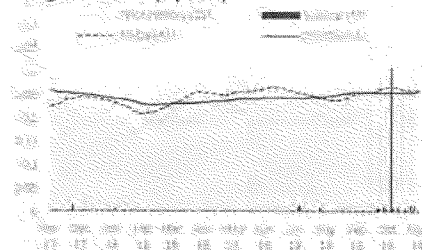
52-Week High / Low \$0.34 / \$0.19
Shares O/S 170 million

Market Capitalization \$44 million
Enterprise Value \$44 million

Daily Volume (3 month avg) 205,280
Currency C\$ unless noted
Web Site www.azargauranium.com
CEO/President Blake Steele

Price Performance

Azarga Uranium Corp. (AZZ-T)



Source: Capital IQ

Please see page 5 for Analyst Certification, pages 4 - 5 for Important Information, Disclaimers and notes.

Exhibit 1: Summary of Azarga's Corporate Resources including new Dewey Burdock Resource

South Dakota

Dewey Burdock ISR Amenable Resource Estimate

| Category | Mt | Avg. GT | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------|-------|---------|-----------------------------------|------------------------------------|
| Measured | 5.200 | 0.73 | 0.132% | 13,799,000 |
| Indicated | 2.328 | 0.40 | 0.068% | 3,160,000 |
| Inferred | 0.732 | 0.33 | 0.056% | 818,000 |
| Global | 8.260 | 0.60 | 0.107% | 17,777,000 |

*At 0.05% U₃O₈ Cut-off & GT Cut-off of 0.5 (M&Ind.) or 0.2 (Inf.)

Dewey Burdock Non-ISR Resource Estimate (above water table)

| Category | Mt | Avg. GT | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|----------|-------|---------|-----------------------------------|------------------------------------|
| Measured | 0.844 | | 0.057% | 1,060,000 |
| Global | 0.844 | | 0.057% | 1,060,000 |

*At 0.02% U₃O₈ Cut-off & GT Cut-off of 0.2 (M&Ind.), 0.2 (Inf.)

Wyoming

Aladdin Resource (5,100 acres surface rights, 4,600 acres mineral rights)

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------|-------|-----------------------------------|------------------------------------|
| Indicated | 0.466 | 0.111% | 1,038,023 |
| Inferred | 0.043 | 0.119% | 101,255 |
| Global | 0.509 | 0.112% | 1,139,278 |

*A 0 GT Cut-off of 0.2 (M,Ind.&Inf.)

** The NI 43-101 Report also identified an "Exploration Target" of 5.0-11.0 Mlb at a grade range of 0.11% to 0.12% U₃O₈ (0.2 GT cut-off) at the Aladdin Project

Gas Hills

| Category | Mt | Avg. GT | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------|-------|---------|-----------------------------------|------------------------------------|
| Indicated | 2.413 | | 0.098% | 4,729,000 |
| Inferred | 2.342 | | 0.054% | 2,529,000 |
| Global | 4.754 | 0.00 | 0.076% | 7,258,000 |

Juniper Ridge

| Category | Mt | Avg. GT | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------|-------|---------|-----------------------------------|------------------------------------|
| Indicated | 5.178 | | 0.058% | 6,006,000 |
| Inferred | 0.107 | | 0.085% | 182,000 |
| Global | 5.285 | | 0.059% | 6,188,000 |

Shirley Basin

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|----------|-------|-----------------------------------|------------------------------------|
| Global | 0.000 | | 0 |

Dewey Terrace (1,834 acres surface rights, 7,514 acres mineral rights)

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|----------|-------|-----------------------------------|------------------------------------|
| Global | 0.000 | | 0 |

Savageton (3,980 acres of Claims and Private Mineral Leases in the PRB)

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------------------|----|-----------------------------------|------------------------------------|
| Historic (non 43-101) | | | 1,000,000 |

*Calculated by the Colorado School of Mines Research Institute

Colorado

Centennial Uranium Project

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|-----------|-------|-----------------------------------|------------------------------------|
| Indicated | 6.873 | 0.090% | 10,371,571 |
| Inferred | 1.365 | 0.090% | 2,325,514 |
| Global | 8.238 | 0.090% | 12,697,085 |

*A 0 GT Cut-off of 0.20 (M,Ind.&Inf.)

Kyrgyz Republic (70%-interest)

Kyzyl Ompul Project

| Category | Mt | U ₃ O ₈ (%) | U ₃ O ₈ (lb) |
|----------|--------|-----------------------------------|------------------------------------|
| Inferred | 15.130 | 0.023% | 7,511,758 |
| Global | 15.130 | 0.023% | 7,511,758 |

*At a 100ppm U₃O₈ Cut-off (M,Ind.&Inf.)

Source: Azarga Uranium, Haywood Presentation

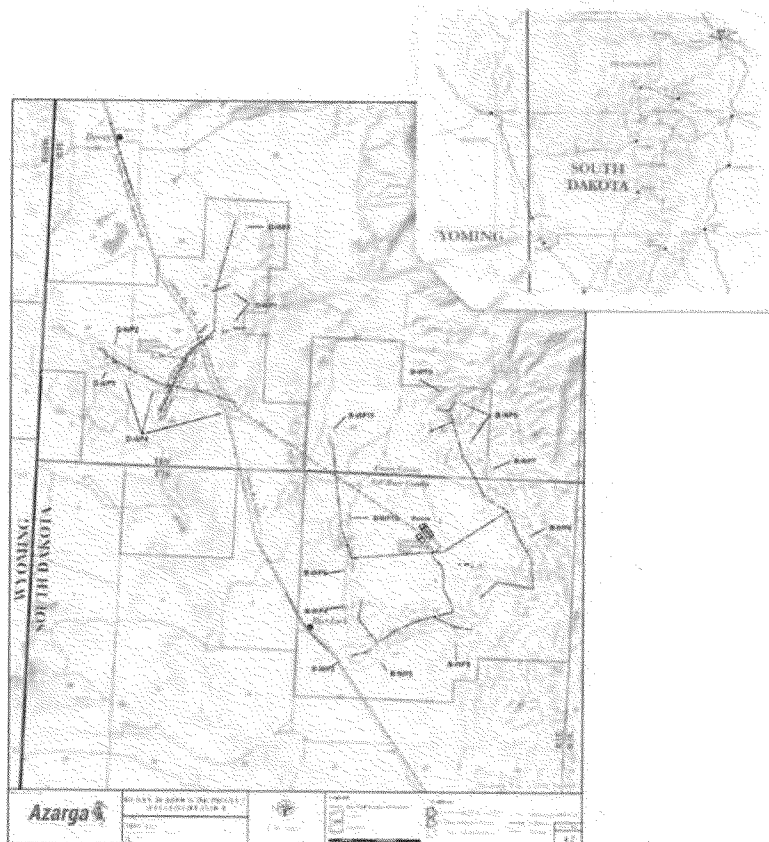


Exhibit 2: Summary of Dewey Burdock 2015 PEA

| | |
|-------------------------------------|------------------------------------|
| Mine Life | 11 years (incl. 2 year ramp-up) |
| Annual Production | 1.0 Mlbs/yr |
| LOM Production | 9.7 Mlbs |
| Initial Capital Costs | US\$27.0M (US\$2.80/lb) |
| Cash Operating Costs | US\$12.53/lb |
| - Plant and well field operation | US\$9.50/lb |
| - Restoration / de-commissioning | US\$1.25/lb |
| - Site management / overhead | US\$2.75/lb |
| Local Taxes & Royalties | US\$6.33/lb |
| Sustaining Capital Costs | US\$14.00/lb |
| Pre / Post Tax NPV8% ⁽¹⁾ | US\$149.4M / US\$113.8M |
| Pre / Post Tax IRR ⁽¹⁾ | 67% / 57% |

Source: Azarga Uranium

Exhibit 3: Dewey Burdock Claims



Source: Dewey Burdock PEA / Azarga Uranium – Haywood modification



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- As of the end of the month immediately preceding this publication either Haywood Securities, Inc., one of its subsidiaries, its officers or directors beneficially owned 1% or more of Azarga Uranium Corp (AZZ-T).
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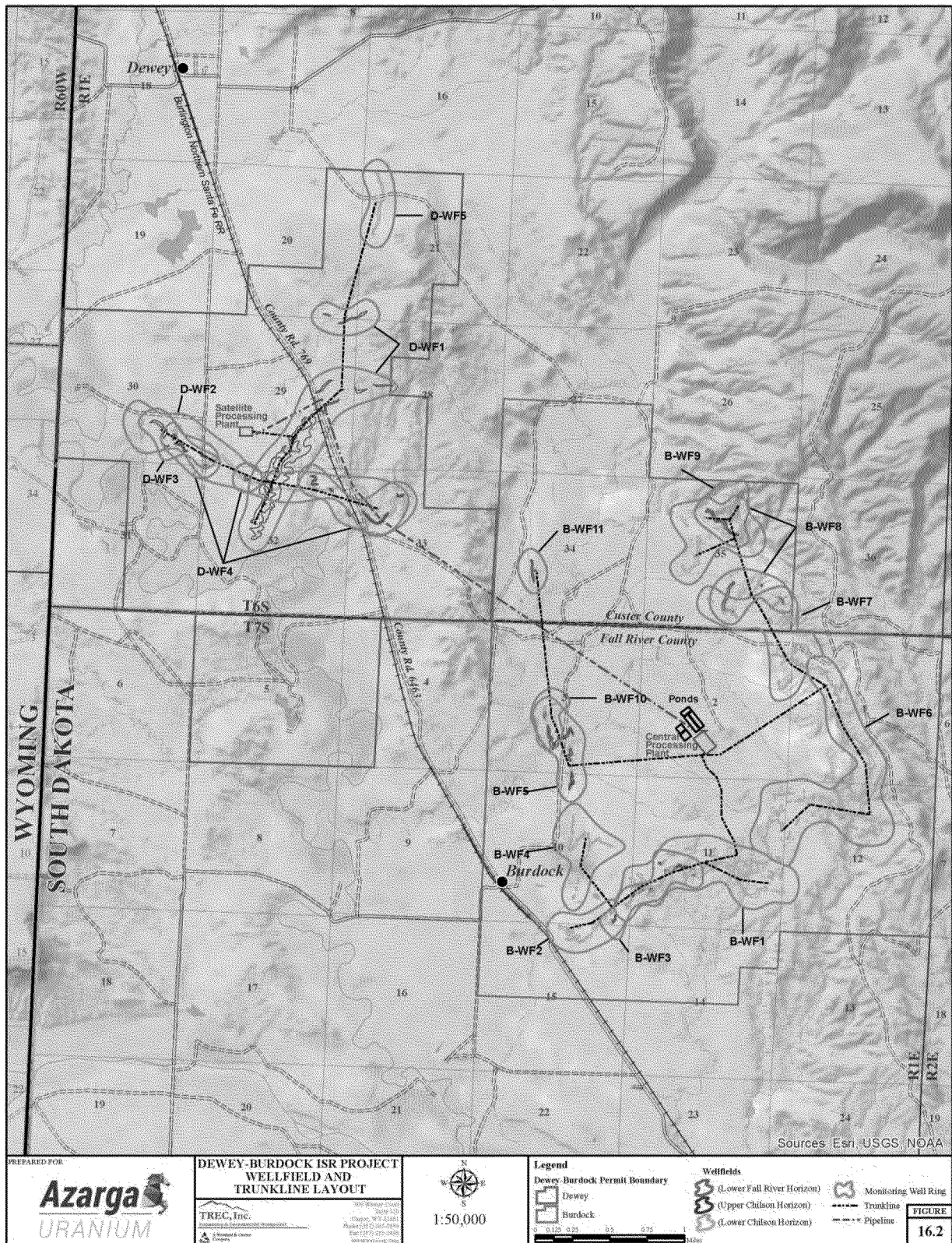
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Each company within an analyst's universe, or group of companies covered, is assigned: (i) a recommendation or rating, usually BUY, HOLD, or SELL; (ii) a 12 month target price, which represents an analyst's current assessment of a company's potential stock price over the next year; (iii) an overall risk rating which represents an analyst's assessment of the company's overall investment risk; and (iv) specific risk ratings or risk profile parameters which in their aggregate support an analyst's overall risk rating. These ratings are more fully explained below. Before acting on our recommendation we caution you to confer with your Haywood investment advisor to determine the suitability of our recommendation for your specific investment objectives, risk tolerance and investment time horizon.

Distribution of Ratings (as of November 14, 2018)

| | % | # | IB Clients (TTM) |
|---------------|-------|----|---------------------|
| Buy | 76.8% | 73 | 96.3% |
| Hold | 10.5% | 10 | 0.0% |
| Sell | 1.1% | 1 | 0.0% |
| Tender | 2.1% | 2 | 0.0% |
| UR (Buy) | 0.0% | 0 | 0.0% |
| UR (Hold) | 0.0% | 0 | 0.0% |
| UR (Sell) | 0.0% | 0 | 0.0% |
| Dropped (TTM) | 9.5% | 9 | 3.7% |

Figure 16.2: Well Field and Trunkline Layout



ATTACHMENT 2

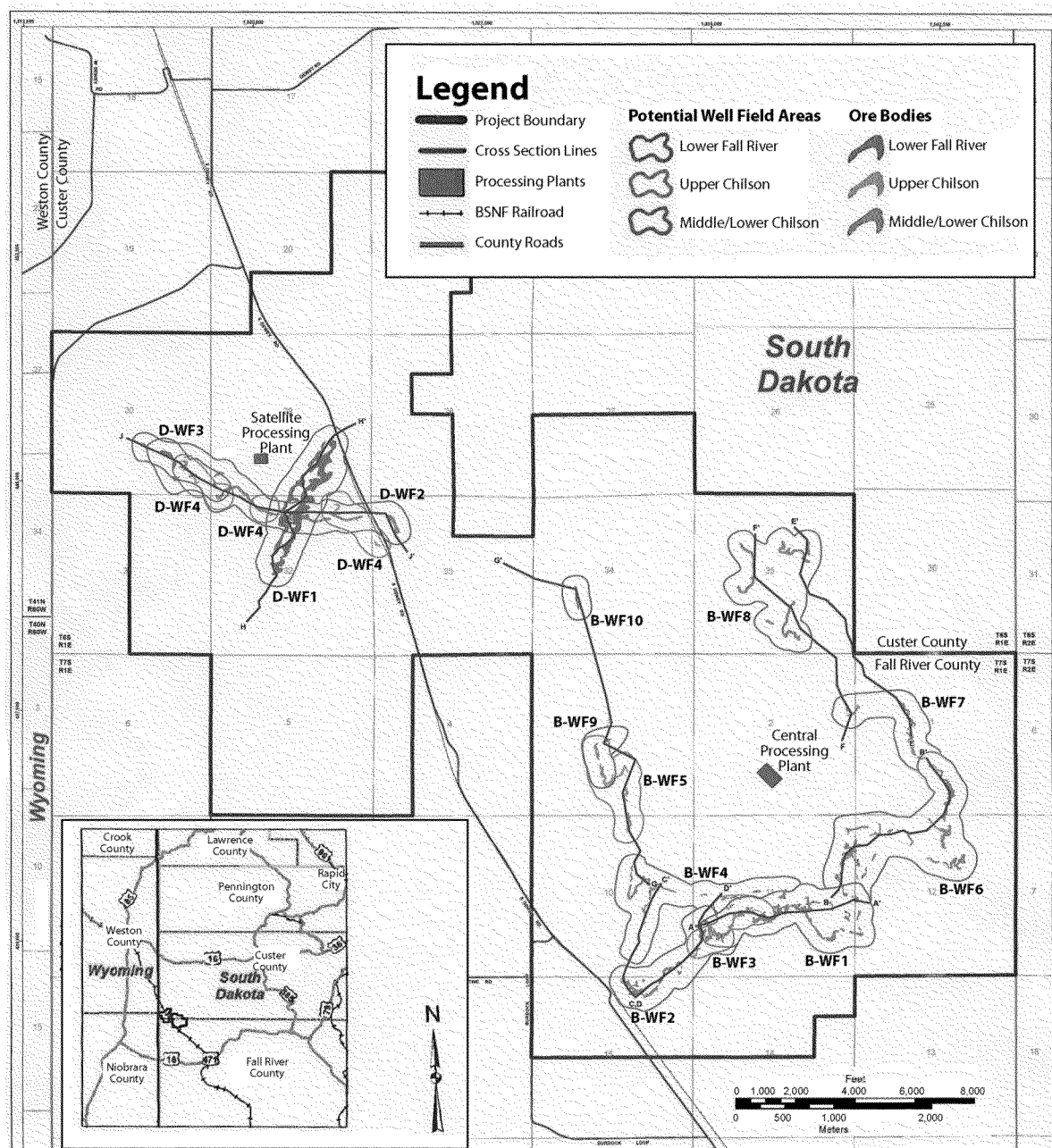


Figure 2.1-6. Map of Dewey-Burdock *In-Situ* Recovery Project Area Showing Locations of the Dewey Satellite Facility, Burdock Central Plant, Mapped Orebodies, and Proposed Wellfields
Source: Modified From Powertech (2011)

the initial wellfields during the construction phase of the proposed project (Powertech, 2010c). The wells will be “cased” by lowering a pipe into the borehole either during or after drilling to prevent the sides of the borehole from caving, prevent loss of drilling fluids into porous formations, and prevent unwanted fluids from entering the borehole. The base of the well casing at all injection and production wells will extend to or below the confining unit overlying the mineralized zone. The screened interval of injection and production wells will be completed only

ATTACHMENT 4

| Hole ID | Zone | Depth (ft) | Thickness (ft) | Avg. GT | Avg. Grade (%) |
|---------|------|---------------|-------------------|------------|-------------------|
| DEX 033 | LE | 649.5 | 6.3 | 0.21 | 0.034 |
| DEX 035 | UD | 627.0 | 9.5 | 0.39 | 0.041 |
| DEX 039 | LE | 650.0 | 10.5 | 0.47 | 0.045 |
| DEX 052 | LD | 640.0 | 1.2 | 0.50 | 0.417 |
| DEX 075 | UD | 602.3 | 4.0 | 0.26 | 0.066 |
| DEX 097 | C | 586.5 | 12.0 | 0.31 | 0.026 |
| DEX 101 | C | 589.0 | 2.0 | 0.23 | 0.114 |
| DEX 113 | UE | 622.0 | 3.2 | 0.21 | 0.065 |
| DEX 113 | UD | 590.5 | 2.9 | 0.32 | 0.112 |
| DEX 116 | LE | 642.0 | 5.0 | 0.33 | 0.067 |
| DEX 125 | C | 585.0 | 6.1 | 0.21 | 0.035 |
| DEX 133 | LE | 638.8 | 3.7 | 0.24 | 0.064 |
| DEX 144 | UD | 604.3 | 3.5 | 0.27 | 0.076 |
| DEX 144 | LD | 613.0 | 8.2 | 0.49 | 0.060 |
| DEX 168 | LE | 632.3 | 2.7 | 0.25 | 0.092 |
| DEX 172 | UD | 599.5 | 6.3 | 0.22 | 0.035 |
| DEX 175 | UE | 626.1 | 2.7 | 0.24 | 0.089 |
| DEX 200 | LD | 718.2 | 10.9 | 0.29 | 0.026 |
| DEX 204 | UD | 665.8 | 11.0 | 0.25 | 0.023 |
| DEX 220 | C | 578.0 | 3.1 | 0.25 | 0.080 |
| DEX 220 | UE | 624.4 | 5.8 | 0.61 | 0.105 |
| DEX 230 | LE | 650.3 | 1.5 | 0.26 | 0.170 |
| DEX 231 | UD | 594.0 | 5.0 | 0.94 | 0.187 |
| DEX 233 | UE | 617.5 | 5.5 | 0.31 | 0.056 |
| DEX 237 | UE | 638.5 | 3.8 | 0.20 | 0.053 |
| DEX 237 | C | 604.7 | 6.3 | 0.30 | 0.048 |
| DEX 240 | LE | 628.0 | 9.0 | 0.90 | 0.100 |
| DEX 241 | C | 594.0 | 7.2 | 0.28 | 0.039 |
| DEX 245 | LD | 615.0 | 6.3 | 0.24 | 0.038 |
| DEX 245 | UD | 599.9 | 9.7 | 0.45 | 0.046 |
| DEX 245 | C | 581.9 | 12.6 | 0.52 | 0.041 |
| DEX 251 | UE | 677.0 | 4.0 | 0.22 | 0.055 |
| DEX 260 | LD | 663.5 | 9.5 | 0.24 | 0.026 |
| DEX 263 | LE | 641.5 | 8.5 | 0.26 | 0.030 |
| DEX 264 | LD | 620.8 | 6.9 | 0.24 | 0.035 |
| DEX 268 | LE | 620.2 | 8.1 | 0.21 | 0.025 |
| DEX 268 | UE | 608.5 | 10.1 | 0.41 | 0.041 |
| DEX 272 | UD | 588.5 | 3.5 | 0.23 | 0.067 |
| DEX 275 | UE | 619.9 | 5.4 | 0.35 | 0.064 |
| DEX 275 | UD | 589.7 | 4.0 | 0.36 | 0.089 |
| DEX 275 | LD | 604.5 | 8.0 | 0.36 | 0.045 |
| DEX 278 | UD | 592.0 | 4.8 | 0.32 | 0.067 |

| | | | | | |
|---------|----|-------|------|------|-------|
| DEX 278 | LE | 634.3 | 4.3 | 0.34 | 0.078 |
| DEX 283 | C | 582.1 | 6.0 | 0.24 | 0.039 |
| DEX 284 | UD | 596.0 | 11.3 | 0.56 | 0.049 |
| DEX 288 | UE | 616.6 | 7.4 | 0.21 | 0.029 |
| DEX 288 | LD | 607.0 | 4.5 | 0.35 | 0.077 |
| DEX 288 | UD | 595.1 | 8.2 | 0.40 | 0.049 |
| DEX 288 | C | 579.5 | 7.9 | 0.47 | 0.060 |
| DEX 289 | UE | 619.0 | 7.5 | 0.75 | 0.099 |
| DEX 291 | UE | 634.9 | 6.1 | 0.39 | 0.065 |
| DEX 292 | LD | 620.0 | 6.7 | 0.34 | 0.050 |
| DEX 292 | UE | 634.0 | 10.6 | 0.38 | 0.036 |
| DEX 297 | LE | 631.2 | 4.3 | 0.22 | 0.051 |
| DEX 297 | UE | 617.0 | 9.3 | 0.47 | 0.051 |
| DEX 308 | LE | 675.0 | 7.5 | 0.51 | 0.068 |
| DEX 309 | LD | 619.0 | 6.8 | 0.21 | 0.031 |
| DEX 326 | LD | 632.0 | 9.4 | 0.39 | 0.041 |
| DEX 326 | UD | 622.0 | 6.0 | 0.56 | 0.094 |
| DEX 327 | LD | 620.0 | 8.0 | 0.22 | 0.027 |
| DEX 328 | UE | 625.5 | 11.5 | 0.47 | 0.041 |
| DEX 338 | C | 591.8 | 2.7 | 0.33 | 0.123 |
| DEX 339 | C | 591.5 | 6.6 | 0.41 | 0.062 |
| DEX 340 | LD | 630.0 | 3.8 | 0.23 | 0.061 |
| DEX 340 | UD | 618.3 | 7.0 | 0.28 | 0.040 |
| DEX 341 | C | 590.0 | 4.6 | 0.32 | 0.068 |
| DEX 344 | UD | 608.0 | 8.2 | 0.38 | 0.047 |
| DEX 344 | LD | 619.5 | 9.5 | 0.43 | 0.046 |
| DEX 348 | UD | 618.5 | 3.2 | 0.20 | 0.064 |
| DEX 362 | UE | 618.3 | 12.9 | 0.41 | 0.032 |
| DEX 362 | UD | 595.0 | 19.5 | 0.45 | 0.023 |
| DEX 374 | LE | 631.3 | 7.5 | 0.23 | 0.030 |
| DEX 375 | LD | 603.8 | 10.2 | 0.22 | 0.022 |
| DEX 378 | UD | 616.0 | 9.0 | 0.41 | 0.045 |
| DEX 378 | LD | 625.0 | 10.5 | 0.47 | 0.045 |
| DEX 384 | C | 582.3 | 6.9 | 0.29 | 0.042 |
| DEX 386 | C | 598.5 | 7.0 | 0.27 | 0.039 |
| DEX 387 | LD | 632.3 | 7.8 | 0.84 | 0.107 |
| DEX 388 | UD | 591.0 | 14.0 | 0.66 | 0.047 |
| DEX 391 | UD | 584.5 | 6.0 | 0.22 | 0.036 |
| DEX 392 | LD | 627.0 | 9.3 | 0.25 | 0.027 |
| DEX 392 | C | 591.0 | 10.5 | 0.38 | 0.036 |
| DEX 392 | UD | 611.1 | 4.0 | 0.70 | 0.175 |
| DEX 393 | UD | 609.0 | 2.7 | 0.46 | 0.170 |
| DEX 393 | C | 598.3 | 2.3 | 0.50 | 0.219 |

| | | | | | |
|----------|----|-------|------|------|-------|
| DEX 393 | LD | 618.8 | 11.0 | 0.79 | 0.072 |
| DEX 397 | C | 578.1 | 9.5 | 0.23 | 0.024 |
| DEX 398 | C | 578.0 | 9.3 | 0.21 | 0.023 |
| DEX 398 | UD | 593.7 | 6.7 | 0.47 | 0.070 |
| DEX 398 | LD | 610.5 | 8.1 | 0.55 | 0.069 |
| DEX 403 | LD | 613.5 | 11.3 | 0.35 | 0.031 |
| DEX 403 | C | 588.9 | 12.6 | 0.36 | 0.029 |
| DEX 404 | UB | 562.0 | 15.3 | 0.38 | 0.025 |
| DEX 417 | C | 583.3 | 11.6 | 0.45 | 0.038 |
| DEX 417 | LD | 611.2 | 10.8 | 0.59 | 0.055 |
| DEX 418 | LD | 619.0 | 4.9 | 0.28 | 0.057 |
| DEX 426 | LD | 595.0 | 10.6 | 0.32 | 0.030 |
| DEX 426 | UD | 583.5 | 2.4 | 0.38 | 0.158 |
| DEX 431 | UE | 614.0 | 5.2 | 0.28 | 0.054 |
| DEX 432 | UD | 594.1 | 9.8 | 0.36 | 0.037 |
| DEX 441 | C | 571.0 | 9.3 | 0.25 | 0.027 |
| DEX 441 | UD | 587.0 | 15.6 | 1.01 | 0.065 |
| DEX 442 | UE | 618.3 | 6.1 | 0.33 | 0.055 |
| DEX 442 | LD | 602.5 | 12.8 | 0.48 | 0.038 |
| DEX 451 | LD | 609.0 | 4.9 | 0.34 | 0.070 |
| DEX 451 | UD | 600.0 | 6.3 | 0.45 | 0.071 |
| DEX 456C | LD | 632.0 | 9.8 | 1.07 | 0.110 |
| DEX 458 | LD | 614.1 | 5.1 | 0.26 | 0.051 |
| DEX 458 | UD | 600.1 | 8.8 | 0.34 | 0.038 |
| DEX 459 | UD | 584.9 | 12.2 | 0.38 | 0.031 |
| DEX 460 | UD | 593.3 | 9.0 | 0.30 | 0.033 |
| DEX 462 | LD | 589.5 | 4.5 | 0.26 | 0.057 |
| DEX 462 | UD | 575.2 | 6.5 | 0.31 | 0.047 |
| DEX 463 | UD | 592.0 | 5.3 | 0.22 | 0.042 |
| DEX 463 | LD | 603.3 | 5.7 | 0.31 | 0.054 |
| DEX 464 | UD | 593.2 | 5.8 | 0.24 | 0.041 |
| DEX 464 | C | 584.0 | 6.7 | 0.27 | 0.040 |
| DEX 469 | UD | 582.1 | 5.0 | 0.37 | 0.074 |
| DEX 471 | UE | 598.3 | 13.2 | 0.70 | 0.053 |
| DEX 473 | UD | 576.0 | 3.2 | 0.20 | 0.063 |
| DEX 474 | C | 585.0 | 3.1 | 0.23 | 0.076 |
| DEX 474 | LD | 610.2 | 5.0 | 0.37 | 0.074 |
| DEX 475 | UD | 581.5 | 8.9 | 0.24 | 0.026 |
| DEX 479 | UD | 582.0 | 11.8 | 0.35 | 0.030 |
| DEX 479 | LD | 599.5 | 4.6 | 0.42 | 0.091 |
| DEX 482 | LD | 585.9 | 6.4 | 0.42 | 0.065 |
| DEX 483 | C | 565.0 | 10.9 | 0.54 | 0.050 |
| ST 23 | FR | 492.0 | 13.5 | 0.38 | 0.028 |

| | | | | | |
|-----------|----|-------|-----|------|-------|
| TER 07-11 | UD | 599.0 | 5.5 | 0.26 | 0.047 |
|-----------|----|-------|-----|------|-------|

The Company also identified 93 drill holes with 112 intercepts that had GT values ranging from 0.1 to 0.2 GT based on review of the Data Set. These intercepts had an average thickness of 4.1 feet with an average grade of 0.041% eU3O8. The remaining 187 drill holes reviewed to date range from barren to an average GT of 0.1.

The technical information in this news release has been prepared in accordance with the Canadian regulatory requirements set out in National Instrument 43-101 ("NI 43-101") and was reviewed by John Mays, P.E., Chief Operating Officer for the Company and a Qualified Person under NI 43-101.

The Data Set includes historical drilling information that has been reviewed by the Company's geological team, as well as 20 exploratory drill holes completed by the Company in a previous exploration campaign. The exploratory drill holes completed by the Company confirm the presence of uranium mineralization at the Dewey Terrace Project. The Company's review of the records and information within the Data Set reasonably substantiate the validity of this information; however, the Company cannot directly verify the accuracy of the historical data, including the procedures used for sample collection and analysis. Therefore, the Company encourages investors not to place undue weight on these results.

About Azarga Uranium Corp.

Azarga Uranium is an integrated uranium exploration and development company that controls six uranium projects, deposits and prospects in the United States of America (South Dakota, Wyoming and Colorado) and the Kyrgyz Republic. The Dewey Burdock in-situ recovery uranium project in South Dakota (the "Dewey Burdock Project"), which is the Company's initial development priority, has received its Nuclear Regulatory Commission License and draft Class III and Class V Underground Injection Control ("UIC") permits from the Environmental Protection Agency ("EPA") and the Company is in the process of completing other major regulatory permit approvals necessary for the construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA.

For more information please visit www.azargauranium.com.

Follow us on Twitter at [@AzargaUranium](https://twitter.com/AzargaUranium).

Disclaimer for Forward-Looking Information

Certain statements in this news release are forward-looking statements, which reflect the expectations of management regarding its disclosure and amendments thereto. Forward-looking statements consist of statements that are not purely historical, including any statements regarding beliefs, plans, expectations or intentions regarding the future. Such statements may include, but are not limited to, statements with respect to the Company's continued efforts to obtain all major regulatory permit approvals necessary for the construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA, the Company's belief that mineralization conditions at the Dewey Terrace Project indicate possible ISR amenability, that the Company's initial analysis indicates uranium resource potential at the Dewey Terrace Project, that uranium mineralization identified in the Data Set indicates possibilities for further discoveries in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, the Company's belief that further analysis of the Data Set will allow expansion of our uranium resources and the location of the identified uranium mineralization at the Dewey Terrace Project presents an opportunity for a nearby satellite project, that the identified mineralization from the Data Set indicates significant potential for a new resource area at the Dewey Terrace Project, that the objective of the Data Set analysis is

to identify uranium mineralization in a cost effective manner in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects and that the Company's is continuing its review of the Data Set for further uranium mineralization with the objective of identifying additional uranium resources. Such statements are subject to risks and uncertainties that may cause actual results, performance or developments to differ materially from those contained in the statements. No assurance can be given that any of the events anticipated by the forward-looking statements will occur or, if they do occur, what benefits the Company will obtain from them.

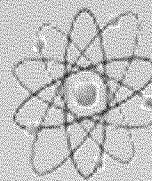
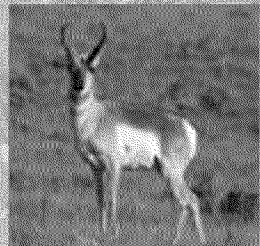
These forward-looking statements reflect management's current views and are based on certain expectations, estimates and assumptions, which may prove to be incorrect. A number of risks and uncertainties could cause our actual results to differ materially from those expressed or implied by the forward-looking statements, including without limitation: (1) the risk that the Company does not obtain all major regulatory permit approvals necessary for construction of the Dewey Burdock Project, including the final Class III and Class V UIC permits from the EPA, (2) the risk that mineralization conditions at the Dewey Terrace Project are not amenable to ISR, (3) the risk that the Company's initial analysis indicating uranium resource potential at the Dewey Terrace Project is not correct, (4) the risk that uranium mineralization identified in the Data Set does not indicate possibilities for further discoveries in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, (5) the risk that further analysis of the Data Set does not allow expansion of the Company's uranium resources and the location of the identified uranium mineralization at the Dewey Terrace Project does not present an opportunity for a nearby satellite project, (6) the risk that the identified mineralization from the Data Set does not indicate significant potential for a new resource area at the Dewey Terrace Project, (7) the risk that the Data Set analysis does not identify uranium mineralization in a cost effective manner in the vicinity of the Company's Dewey Terrace and Dewey Burdock Projects, (8) the risk that the Company's review of the Data Set does not identify further uranium mineralization and additional uranium resources are not identified, (9) the risk that such statements may prove to be inaccurate and (10) other factors beyond the Company's control. These forward-looking statements are made as of the date of this news release and, except as required by applicable securities laws, the Company assumes no obligation to update these forward-looking statements, or to update the reasons why actual results differed from those projected in the forward-looking statements. Additional information about these and other assumptions, risks and uncertainties are set out in the "Risks and Uncertainties" section in the Company's most recent MD&A filed with Canadian security regulators.

The TSX has not reviewed and does not accept responsibility for the adequacy or accuracy of the content of this News Release.

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ATTACHMENT 5



POWERTECH (USA) INC.

**Dewey-Burdock Project
Application for NRC
Uranium Recovery License
Fall River and Custer Counties,
South Dakota
Technical Report**

February 2009

Prepared for
**U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852**

Prepared by
**Powertech (USA) Inc.
5575 DTC Parkway, Suite #140
Greenwood Village, CO 80111
Phone: 303-790-7528
Facsimile: 303-790-3885**



1.8 Operating Plans, Design Throughput, and Production

The Proposed Action will utilize uranium ISL production facilities at both the Dewey and Burdock sites with a CPP located at the Burdock site. The IX process and well fields are designed for a nominal flow rate of 2000 gpm at each site. Total production from both sites is expected to produce approximately 1,000,000 pounds of U_3O_8 per year.

1.9 Project Schedule

Following the issuance of an NRC uranium recovery license and other relevant permits it is anticipated that construction of the Burdock Well Field 1, CPP and ancillary facilities including storage ponds and land application pivots will commence. The construction of the Dewey Well Field 1 and ancillary facilities will follow shortly thereafter. Startup of the Dewey and Burdock operations will commence upon completion of construction and will continue for approximately 7 to 20 years or more during which additional well fields will be completed along the roll fronts at both Dewey and Burdock sites. It is planned that groundwater restoration can be accomplished within NRC requirements for timeliness in decommissioning (10 CFR § 40.42); however, in the event restoration cannot be accomplished within this timeframe, Powertech (USA) will seek NRC approval for an alternate schedule. The projected construction, operation, restoration and decommissioning schedule is provided in Figure 1.9-1.

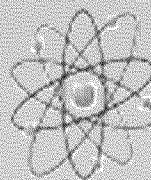
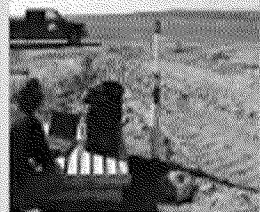
Decommissioning of the well fields including well abandonment, the removal of piping, tanks, ancillary buildings and equipment, cleanup of surface soil to applicable standards and revegetation of disturbed areas will be implemented following the cessation of ISL operations at the Dewey and Burdock sites. It is likely that the CPP at the Burdock site will continue to operate for several years following the decommissioning of the Proposed Action well fields. The CPP may continue to process uranium from other ISL projects such as the nearby Powertech (USA) satellite ISL projects of Aladdin and Dewey Terrace planned in Wyoming, as well as possible tolling arrangements with other operators.

ATTACHMENT 6

| | | | |
|---|-------------------------------|--|--|
| United States Environmental Protection Agency Underground Injection Control Permit Application <i>(Collected under the authority of the Safe Drinking Water Act, Sections 1421, 1422, 40 CFR 144)</i> | | I. EPA ID Number | |
| | | T/A C | |
| | | U | |
| Read Attached Instructions Before Starting For Official Use Only | | | |
| Application approved mo day year | | Date received mo day year | |
| Permit Number | | Well ID | |
| FINDS Number | | | |
| II. Owner Name and Address | | III. Operator Name and Address | |
| Owner Name Powertech (USA) Inc. | | Owner Name Powertech (USA) Inc. | |
| Street Address 5575 DTC Parkway, Suite 140 | | Street Address 5575 DTC Parkway, Suite 140 | |
| Phone Number (303) 790-7528 | | Phone Number (303) 790-7528 | |
| City Greenwood Village | State CO | ZIP CODE 80111 | |
| IV. Commercial Facility | | V. Ownership | |
| <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | <input checked="" type="checkbox"/> Private <input type="checkbox"/> Federal <input type="checkbox"/> Other | |
| VI. Legal Contact | | VII. SIC Codes | |
| <input checked="" type="checkbox"/> Owner <input type="checkbox"/> Operator | | SIC: 1094 NAISC: 212291 | |
| VIII. Well Status (Mark "x") | | | |
| <input type="checkbox"/> A. Operating Date Started mo day year | | <input type="checkbox"/> B. Modification/Conversion <input checked="" type="checkbox"/> C. Proposed | |
| IX. Type of Permit Requested (Mark "x" and specify if required) | | | |
| <input type="checkbox"/> A. Individual <input checked="" type="checkbox"/> B. Area | | Number of Existing Wells 0 Number of Proposed Wells Up to 4,000 Name(s) of field(s) or project(s) Dewey-Burdock | |
| X. Class and Type of Well (see reverse) | | | |
| A. Class(es) (enter code(s)) | B. Type(s) (enter code(s)) | C. If class is "other" or type is code 'x,' explain | D. Number of wells per type (if area permit) |
| III | U | | Up to 4,000 |
| XI. Location of Well(s) or Approximate Center of Field or Project | | | XII. Indian Lands (Mark "x") |
| Latitude Longitude Township and Range Deg Min Sec Deg Min Sec Sec Twp Range 1/4 Sec Feet From Line Feet From Line 103 59 43 43 28 55 34 6S 1E SW 93 W 1403 S | | | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| XIII. Attachments | | | |
| (Complete the following questions on a separate sheet(s) and number accordingly; see instructions) For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A-U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application. | | | |
| XIV. Certification | | | |
| I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32) | | | |
| A. Name and Title (Type or Print) Richard Blubaugh, Vice President Environmental Health & Safety Resources | | | B. Phone No. (Area Code and No.) (303) 790-7528 |
| C. Signature | | | D. Date Signed 8/1/2012 |

Following regulatory approval of successful aquifer restoration, each well field will be decommissioned. It is likely that the CPP will continue to operate for several years following decommissioning of the well fields. The CPP may continue to process uranium-loaded ion exchange resin from other ISR projects such as the nearby Powertech Aladdin and Dewey Terrace ISR projects planned in Wyoming, as well as possible tolling arrangements with other operators. The entire Dewey-Burdock Project will then be decommissioned and reclaimed in accordance with NRC, EPA, BLM and DENR requirements. The projected construction, operation, restoration and decommissioning schedule is provided in Figure 10.2.

ATTACHMENT 7



POWERTECH (USA) INC.

**Dewey-Burdock Project
Application for NRC
Uranium Recovery License
Fall River and Custer Counties,
South Dakota
Environmental Report**

February 2009

Prepared for
**U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852**

Prepared by
**Powertech (USA) Inc.
5575 DTC Parkway, Suite #140
Greenwood Village, CO 80111
Phone: 303-790-7528
Facsimile: 303-790-3885**

Dewey and Burdock sites. The projected schedule for construction, operation, and decommissioning (including restoration) is provided in Figure 1.3-1.

In each well field, production activities will proceed until such time as the uranium concentration in the pregnant solution has declined to an uneconomic recovery level. After production ceases, Powertech (USA) will be restoring the groundwater consistent with baseline and in accordance with 10 CFR Part 40 Appendix A, Criterion 5(b)(5). Reclamation of surface disturbances will occur after completion of restoration activities in a well field and will continue the same manner after additional well fields are developed, produced and restored. Therefore, at any time there may be well fields in three different stages of the process: wellfields in production, well fields undergoing groundwater restoration, and well fields undergoing surface reclamation. Additionally, there also may be some small areas indirectly related to these process phases that are held unreclaimed for short periods of time (e.g., storage of top soil). This proposed operational and reclamation plan ensures minimal potential environmental impacts.

D&D of the well fields includes well abandonment, the removal of piping, tanks, ancillary buildings and equipment, cleanup of surface soil to radiological standards in 10 CFR Part 40, Appendix A, Criterion 6 and revegetation of disturbed areas. It is likely that the CPP at the Burdock site will continue to operate for several years following the D&D of the project well fields. The Proposed Action is for the plant to continue to receive and process uranium loaded resins from other Proposed Projects such as Powertech's nearby Aladdin and Dewey Terrace Proposed Satellite Facility Projects planned in Wyoming or from other licensed ISL operators or other licensed facilities generating uranium-loaded resins that are compatible with the Powertech (USA) production process.

ATTACHMENT 8

ORDER / CASE NO: ORDER NO. 5-2019

ORDER / NOTICE OF

RECOMMENDATION TYPE: EXCEPTION LOCATION

COUNTY: FALL RIVER

**LOCATION(S): T. 8S., R. 1E.,
SEC. 7**

OPERATOR: T-C OIL COMPANY, LLC

DATE ORDER ISSUED: 07/09/2019

DATE ORDER CLOSED:

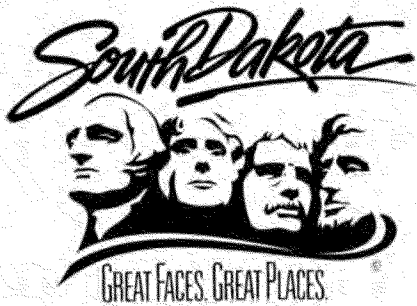
AMENDS:

AMENDED BY:

APPROVAL STATUS:

FIELD NAME:

UNIT NAME:



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

July 9, 2019

Gerald Freidrichs
Drilling Supervisor
T-C Oil Company, LLC
427 FM 774
Refugio, TX 78377

Dear Mr. Freidrichs:

Thank you for your application filed May 28, 2019, requesting approval to drill an oil well at a location that is an exception to statewide spacing. The well is located 513 feet from the east line and 261 feet from the north line in Section 7, Township 8 South, Range 1 East, approximately 11.9 miles northwest of Edgemont, Fall River County, SD.

The department published a Notice of Recommendation, Oil and Gas Case No. 5-2019, recommending approval of the application. The date for intervention was July 3, 2019, and no parties petitioned the Board of Minerals and Environment for a hearing on the application by the deadline.

Therefore, in accordance with the Administrative Rules of South Dakota 74:12:02:08 and 74:12:02:09, approval of the application is hereby granted. Enclosed is the Notice of Recommendation.

If our office can be of further assistance to you, please do not hesitate to contact me at (605) 773-4201.

Sincerely,

Mike Lees, Administrator
Minerals and Mining Program

Enclosure

cy/w enc: Joe Rochelle, P.E., Engineer for T-C Oil Company, LLC, Allen & Crouch Petroleum Engineers, P. O. Box 976, Casper, WY 82601

STATE OF SOUTH DAKOTA
SECRETARY OF THE
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF T-C OIL COMPANY, LLC, REFUGIO, TX, FOR A PERMIT TO DRILL AN OIL AND GAS WELL AT AN EXCEPTION LOCATION TO STATEWIDE SPACING, DESCRIBED AS THE SOUTH DAKOTA FEDERAL 7-1 WELL, LOCATED 261 FEET FROM THE NORTH LINE AND 513 FEET FROM THE EAST LINE IN SECTION 7, TOWNSHIP 8 SOUTH, RANGE 1 EAST; APPROXIMATELY 11.9 MILES NORTHWEST OF EDMONT, FALL RIVER COUNTY, SD.

NOTICE
OF
RECOMMENDATION

OIL AND GAS
CASE NO. 5-2019

Notice is hereby given to the public and to all interested persons that pursuant to South Dakota Codified Laws (SDCL) Chapter 1-26 and Chapter 45-9 and further pursuant to the Administrative Rules of South Dakota (ARSD) 74:12:02:08 and 74:12:09, the following matter has come to the attention of the Secretary of the Department of Environment and Natural Resources, hereinafter "Secretary."

The Secretary recommends approval of the exception location for the following reasons:

1. The applicant asserts that drilling this well at the location prescribed by the statewide spacing rule would likely result in a well unable to produce in economic quantities, as indicated by three dimensional seismic interpretation.
2. No other producing or drilled oil and gas wells are located within 1,000 feet of the proposed location.

Authority for the Secretary to approve this application is contained in ARSD 74:12:02:08 and 74:12:09. Unless a person files a petition requesting a hearing on the above application pursuant to the provisions of ARSD 74:09:01 on or before July 3, 2019, the Secretary's recommendation will be considered final and the Secretary will approve the application in accordance with that recommendation.

The application and notice of recommendation are also posted on the department's website at: <http://denr.sd.gov/des/og/pubhearing.aspx> and <http://denr.sd.gov/public>. Additional information about this application is available from Mike Lees, Administrator, Minerals and Mining Program, Department of Environment and Natural Resources, 523 East Capitol Avenue, Pierre, SD 57501, telephone (605) 773-4201, email michael.lees@state.sd.us.

June 7, 2019



Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.



ALLEN & CROUCH
PETROLEUM ENGINEERS

RECEIVED

JUL 01 2019

MINERALS & MINING PROGRAM

June 26, 2019

Re: Reply to Letter Dated June 7, 2019 Notice of Recommendation
T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377
South Dakota Federal 7-1 (Confidential)
261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

Department of Environment and Natural Resources Attention: Miles Lee
Joe Foss Building 523 East Capitol
Pierre, South Dakota 57501

Dear Mr. Lee:

This letter is a response to the South Dakota Department of Environment & Natural Resources letter dated June 7, 2019 for the South Dakota Federal 7-1 exception request.

Please find attached:

1. Affidavit of Notification
2. Certified mail return receipts
3. A list of persons notified

All of the mineral property within one-half mile of the location is owned or has been leased by T-C Oil Company, LLC.

If you have any questions or need additional information, please call me at (307) 234-3571.

Sincerely,

Joe Rochelle, PE
Engineer for T-C Oil Company, LLC

Attachments

Cc: Gerald Friedrichs T-C Oil Company

Re: Request for Location Exception

T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377

South Dakota Federal 7-1 (Confidential)

261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

AFFIDAVIT OF NOTIFICATION

STATE OF WYOMING)
) ss
COUNTY OF NATRONA)

The undersigned, Joe Rochelle, of lawful age, after having first duly sworn upon his oath, disposes and states:

- All of the lease operators or owners, all surface owners and royalty owners within a one-half (1/2) mile radius of the proposed South Dakota Federal 7-1 are listed on Exhibit L-1.
- Notifications of the application were mailed by certified mail, return receipt requested, to all of the lease operators or owners and all surface owners listed on Exhibit L-1, by depositing same in the same in the United States mail on the 26th Day of June, 2019.

By: Joe Rochelle
Joe Rochelle

for T-C Oil Company, LLC

STATE OF WYOMING)
) ss
COUNTY OF NATRONA)

The foregoing instrument was subscribed and sworn to before me this 26th day of June 2019.

Witness my hand and official seal.

[Signature]
Notary Public

My Commission Expires:

MARCH 24, 2022

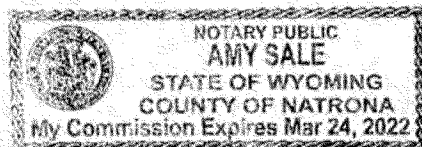


Exhibit L-1

List of Surface Owners, Lease Operators, Mineral Owners within ½ mile radius of the South Dakota Federal 7-1 NE NE Section 7-T8S-R1E, Fall River County, South Dakota.

Name and Address

Type of Interest

T-C Oil Company, LLC
427 FM 774
Refugio, TX 78377

Lease Owner

Nebraska National Forest and Grasslands
1801 Highway 18 Bypass
Hot Springs, SD 57747

Surface Owner

Bureau of Land Management
North Dakota Field Office
99 23rd Ave., Suite A
Dickinson, ND 58601

Mineral Owner

Bureau of Land Management
South Dakota Field Office
310 Roundup Street
Belle Fourche, SD 57717

Mineral Owner

U.S. Postal Service[™]
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For delivery information, visit our website at www.usps.com.

DICKINSON, ND 58601

Certified Mail Fee \$3.50
\$2.80
Extra Services & Fees (check box, add fee as appropriate)
☐ Return Receipt (hardcopy) \$0.00
☐ Return Receipt (electronic) \$0.00
☐ Certified Mail Restricted Delivery \$0.00
☐ Adult Signature Required \$0.00
☐ Adult Signature Restricted Delivery \$0.00

Postage \$0.55

Total Postage \$6.85

Sent To North Dakota Field Office
Street and 99 23rd Ave., Suite A
City, State Dickinson, ND 58601

PS Form

Postmark
Here

06/26/2019

21

U.S. Postal Service[™]
CERTIFIED MAIL[®] RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com.

HOT SPRINGS, SD 57747

Certified Mail Fee \$3.50
\$2.80
Extra Services & Fees (check box, add fee as appropriate)
☐ Return Receipt (hardcopy) \$0.00
☐ Return Receipt (electronic) \$0.00
☐ Certified Mail Restricted Delivery \$0.00
☐ Adult Signature Required \$0.00
☐ Adult Signature Restricted Delivery \$0.00

Postage \$0.55

Total Postage \$6.85

Sent To Nebraska National Forest & Grasslands
Street and 1801 Highway 18 Bypass
City, State Hot Springs, SD 57747

PS Form 3800, April 2015 PSN 7530-02-000-9047

Postmark
Here

06/26/2019

21

U.S. Postal Service[™]
CERTIFIED MAIL[®] RECEIPT
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For delivery information, visit our website at www.usps.com.

REFUGIO, TX 78377

Certified Mail Fee \$3.50
\$2.80
Extra Services & Fees (check box, add fee as appropriate)
☐ Return Receipt (hardcopy) \$0.00
☐ Return Receipt (electronic) \$0.00
☐ Certified Mail Restricted Delivery \$0.00
☐ Adult Signature Required \$0.00
☐ Adult Signature Restricted Delivery \$0.00

Postage \$0.55

Total Postage \$6.85

Sent To T-C Oil Company, LLC
Street and 427 FM 774
City, State Refugio, TX 78377

PS Form 3800, April 2015 PSN 7530-02-000-9047

U.S. Postal Service[™]
CERTIFIED MAIL[®] RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com.

BELLE FOURCHE, SD 57717

Certified Mail Fee \$3.50
\$2.80
Extra Services & Fees (check box, add fee as appropriate)
☐ Return Receipt (hardcopy) \$0.00
☐ Return Receipt (electronic) \$0.00
☐ Certified Mail Restricted Delivery \$0.00
☐ Adult Signature Required \$0.00
☐ Adult Signature Restricted Delivery \$0.00

Postage \$0.55

Total Postage \$6.85

Sent To South Dakota Field Office
Street and 310 Roundup Street
City, State Belle Fourche, SD 57717

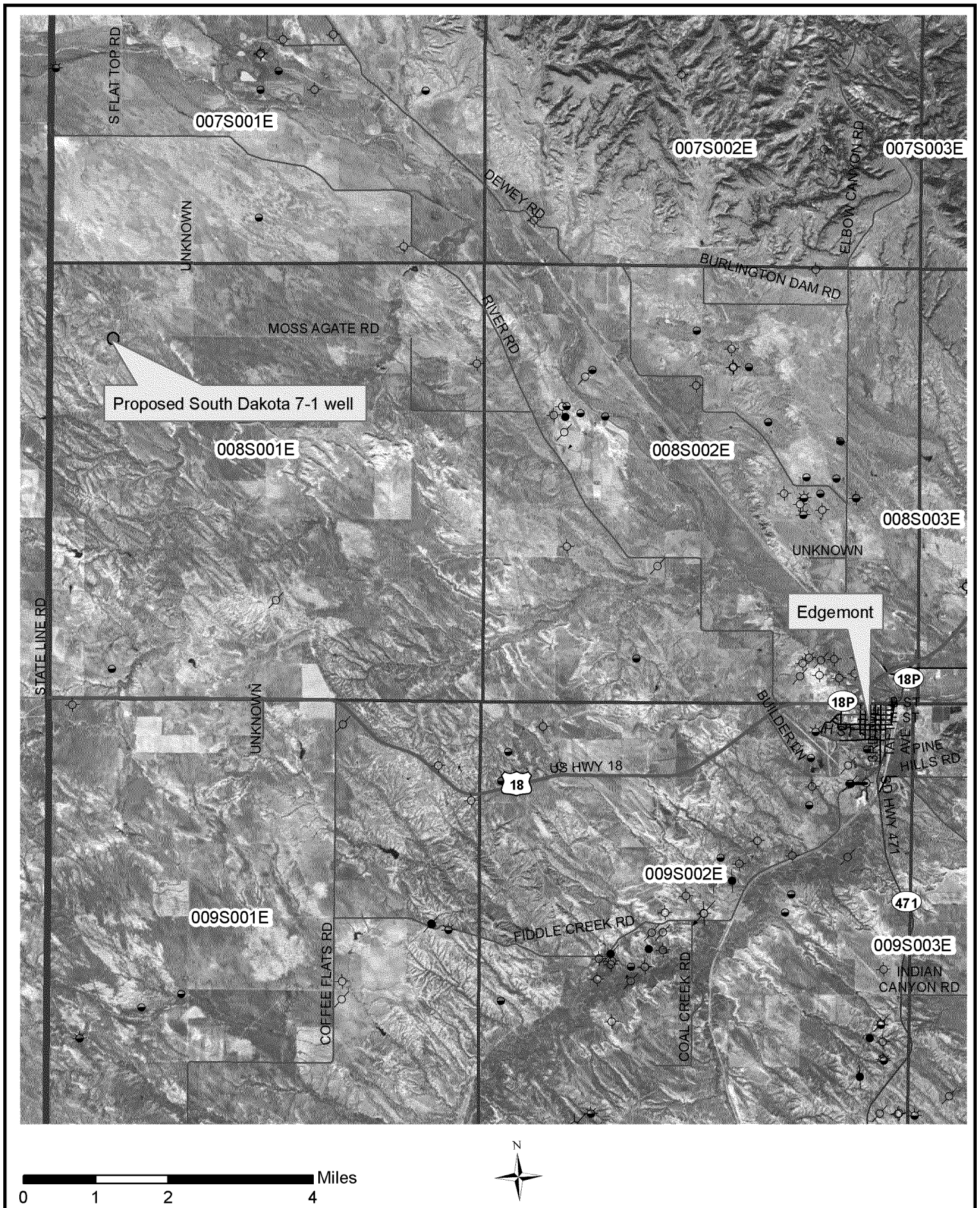
PS Form 3800, April 2015 PSN 7530-02-000-9047

Postmark
Here

06/26/2019

21

South Dakota 7-1 Locator Map, T-C Oil



Affidavit of PublicationState of South Dakota
County of Fall River**RECEIVED**

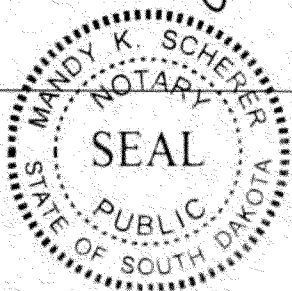
JUN 17 2019

DEPT OF ENVIRONMENT & NATURAL
RESOURCES - RAPID CITY

Taylor Risse, being, first duly sworn, on oath, says: That he/she is an employee of Scherer Publishing, LLC, and that the Fall River County Herald is, and during all the times hereinafter mentioned was, a weekly legal newspaper as defined in the SDCL 17-2-2.1 through the 17-2-2.4 inclusive; that said newspaper has been published within the said county of Fall River and State of South Dakota, for at least one year next prior to the first publication of the attached public notice, and that the printed copy of which, taken from the paper in which the same was published, and which is hereto attached and made a part of this affidavit, was published in said newspaper for **1** successive week(s) to wit:

June 13, 2019

That the full amount of the fee charged for the publication of the attached public notice, **\$31.74** insures to the sole benefit of the publisher or publishers; that no agreement or understanding for the division thereof has been made with any other person, and that no part thereof has been agreed to be paid to any person whomsoever; that the fees charged for the publication thereof are:

Signed: Subscribed and sworn to before me this 13 day of June, 2019.
Notary PublicMy Commission Expires
December 9, 2021

LEGALIS

Notice of Vacancy

Notice: There is a vacancy in Ward B for the Election Precinct Judge for the Council of the town. If you would like to be considered for the position, please mail in a letter in person or letter of interest to City Hall, 112 West 1st St., Fall River, SD 57030. The letter must be received by the City Clerk, 112 West 1st St., Fall River, SD 57030, by June 18, 2019, at 1:00 p.m. Published: June 13, 2019, by 1:00 p.m.

Proceedings

City of Edgemont Council Meeting
Regular Session
June 1, 2019

Call To Order - Roll Call: Mayor Jerry Tisdell called the regular meeting of the Edgemont Council to order at 7:00 p.m. on June 3, 2019, at the Edgemont City Hall. Present were Council Members: Roger Hartman, Kimberly Minkley, Carla Schaefer, John Stingers, and Robert Winkler.

The Pledge of Allegiance: was stated.

Conflict of Interest For Council Members: No conflicts were found.

Approval Of Agenda: Mayor Tisdell made a motion to approve the June 3, 2019 agenda. Motion seconded by John Stingers. Motion carried with unanimous vote.

Approval Of Minutes: Mayor Tisdell made a motion to approve the May 21, 2019 minutes. Motion seconded by John Stingers. Motion carried with unanimous vote.

Committee Reports: Law Enforcement - Frank Kerk. Public Works - Tom Haxel. Both stated that they have been busy working on the water main 34th St. and the computer school is making great progress. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule.

Public Hearing: No public hearing was held.

Approval Of Claims: Mayor Tisdell made a motion to approve the June 1, 2019 claims totaling \$8,145.16. Motion seconded by John Stingers. Motion carried with unanimous vote.

Mayor's Report: Mayor Tisdell made a report on the city's progress. He mentioned the water main project, the computer school, and the public hearing. He also mentioned the city's financial status and the city's future plans.

Old Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

New Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

Proceedings

Fall River Council, Approved Minutes of May 1, 2019.

The Fall River Council, at its regular meeting held on May 1, 2019, at 7:00 p.m., at the Fall River City Hall, 112 West 1st St., Fall River, SD 57030, the following agenda items were discussed:

Call To Order: Mayor Tisdell called the meeting to order at 7:00 p.m. on May 1, 2019, at the Fall River City Hall. Present were Council Members: Roger Hartman, Kimberly Minkley, Carla Schaefer, John Stingers, and Robert Winkler.

The Pledge of Allegiance: was stated.

Conflict of Interest For Council Members: No conflicts were found.

Approval Of Agenda: Mayor Tisdell made a motion to approve the June 3, 2019 agenda. Motion seconded by John Stingers. Motion carried with unanimous vote.

Approval Of Minutes: Mayor Tisdell made a motion to approve the May 21, 2019 minutes. Motion seconded by John Stingers. Motion carried with unanimous vote.

2019 Community Fall River, SD 57030. The meeting was held on June 3, 2019, at 7:00 p.m. at the Fall River City Hall, 112 West 1st St., Fall River, SD 57030. The following agenda items were discussed:

Call To Order: Mayor Tisdell called the meeting to order at 7:00 p.m. on June 3, 2019, at the Fall River City Hall. Present were Council Members: Roger Hartman, Kimberly Minkley, Carla Schaefer, John Stingers, and Robert Winkler.

The Pledge of Allegiance: was stated.

Conflict of Interest For Council Members: No conflicts were found.

Approval Of Agenda: Mayor Tisdell made a motion to approve the June 3, 2019 agenda. Motion seconded by John Stingers. Motion carried with unanimous vote.

Approval Of Minutes: Mayor Tisdell made a motion to approve the May 21, 2019 minutes. Motion seconded by John Stingers. Motion carried with unanimous vote.

Committee Reports: Law Enforcement - Frank Kerk. Public Works - Tom Haxel. Both stated that they have been busy working on the water main 34th St. and the computer school is making great progress. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule.

Public Hearing: No public hearing was held.

Approval Of Claims: Mayor Tisdell made a motion to approve the June 1, 2019 claims totaling \$8,145.16. Motion seconded by John Stingers. Motion carried with unanimous vote.

Mayor's Report: Mayor Tisdell made a report on the city's progress. He mentioned the water main project, the computer school, and the public hearing. He also mentioned the city's financial status and the city's future plans.

Old Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

New Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

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Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

At Edgemont, City of Edgemont, Mayor Tisdell called the meeting to order at 7:00 p.m. on June 3, 2019, at the Edgemont City Hall, 112 West 1st St., Edgemont, SD 57030. The following agenda items were discussed:

Call To Order: Mayor Tisdell called the meeting to order at 7:00 p.m. on June 3, 2019, at the Edgemont City Hall. Present were Council Members: Roger Hartman, Kimberly Minkley, Carla Schaefer, John Stingers, and Robert Winkler.

The Pledge of Allegiance: was stated.

Conflict of Interest For Council Members: No conflicts were found.

Approval Of Agenda: Mayor Tisdell made a motion to approve the June 3, 2019 agenda. Motion seconded by John Stingers. Motion carried with unanimous vote.

Approval Of Minutes: Mayor Tisdell made a motion to approve the May 21, 2019 minutes. Motion seconded by John Stingers. Motion carried with unanimous vote.

Committee Reports: Law Enforcement - Frank Kerk. Public Works - Tom Haxel. Both stated that they have been busy working on the water main 34th St. and the computer school is making great progress. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule. A bid was received for the school, about \$1.1 million. The bid is expected to be received by the end of the month. The project is on schedule.

Public Hearing: No public hearing was held.

Approval Of Claims: Mayor Tisdell made a motion to approve the June 1, 2019 claims totaling \$8,145.16. Motion seconded by John Stingers. Motion carried with unanimous vote.

Mayor's Report: Mayor Tisdell made a report on the city's progress. He mentioned the water main project, the computer school, and the public hearing. He also mentioned the city's financial status and the city's future plans.

Old Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

New Business: Mayor Tisdell made a motion to approve the agenda item for the water main project. Motion seconded by John Stingers. Motion carried with unanimous vote.

Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

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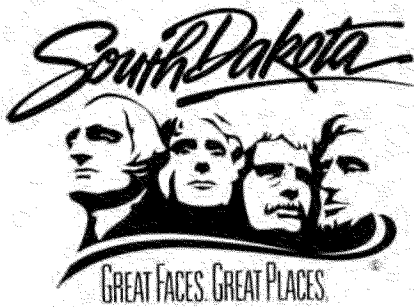
Adjournment: Mayor Tisdell made a motion to adjourn the meeting. Motion seconded by John Stingers. Motion carried with unanimous vote.

2019 WORLD STANDINGS

As of June 10, 2019

| All Around | Nutrition |
|--------------------------|--------------------------|
| 1. USA (100.00) | 1. USA (100.00) |
| 2. Canada (98.50) | 2. Canada (98.50) |
| 3. Russia (97.00) | 3. Russia (97.00) |
| 4. China (95.50) | 4. China (95.50) |
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| 11. Netherlands (85.00) | 11. Netherlands (85.00) |
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| 14. Austria (80.50) | 14. Austria (80.50) |
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| 21. Kazakhstan (70.00) | 21. Kazakhstan (70.00) |
| 22. Azerbaijan (68.50) | 22. Azerbaijan (68.50) |
| 23. Georgia (67.00) | 23. Georgia (67.00) |
| 24. Armenia (65.50) | 24. Armenia (65.50) |
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| 26. Israel (62.50) | 26. Israel (62.50) |
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| 28. Egypt (59.50) | 28. Egypt (59.50) |
| 29. Jordan (58.00) | 29. Jordan (58.00) |
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| 34. Oman (50.50) | 34. Oman (50.50) |
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| 36. Yemen (47.50) | 36. Yemen (47.50) |
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| 38. Bahrain (44.50) | 38. Bahrain (44.50) |
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| 42. Indonesia (38.50) | 42. Indonesia (38.50) |
| 43. Philippines (37.00) | 43. Philippines (37.00) |
| 44. Thailand (35.50) | 44. Thailand (35.50) |
| 45. Vietnam (34.00) | 45. Vietnam (34.00) |
| 46. Laos (32.50) | 46. Laos (32.50) |
| 47. Cambodia (31.00) | 47. Cambodia (31.00) |
| 48. Myanmar (29.50) | 48. Myanmar (29.50) |
| 49. Bangladesh (28.00) | 49. Bangladesh (28.00) |
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| 51. India (25.00) | 51. India (25.00) |
| 52. Nepal (23.50) | 52. Nepal (23.50) |
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| 99. Canada (0.00) | 99. Canada (0.00) |
| 100. USA (0.00) | 100. USA (0.00) |

Wanda's Finds
1 minute north on 385 www.wandasfinds.com
Fall Springs, SD 57747 605 745 4040



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

June 7, 2019

Gerald Freidrichs
Drilling Supervisor
T-C Oil Company, LLC
427 FM 774
Refugio, TX 78377

Dear Mr. Freidrichs:

Enclosed is a copy of the Notice of Recommendation for T-C Oil Company, LLC, Refugio, TX - Oil and Gas Case No. 5-2019, Fall River County, SD. The Notice of Recommendation has been sent to the Fall River County Herald for publication on Thursday, June 13, 2019.

The purpose of this letter is to advise you that it is the applicant's responsibility to serve notice on those persons "....whose property may be affected..." as specified in South Dakota Codified Laws 45-9-58.

Please file with this office the following:

1. Affidavit of Notification
2. Certified mail return receipts
3. A list of persons notified

The department recommends T-C Oil Company complete its notification, and submits the affidavit of notification and the list of persons notified prior to the end of the notification period specified in the enclosed notice of recommendation.

Thank you for your cooperation.

Sincerely,

Mike Lees, Administrator
Minerals and Mining Program

Enclosure

cy/w enc: Joe Rochelle, P.E., Engineer for T-C Oil Company, LLC, Allen & Crouch Petroleum Engineers, P. O. Box 976, Casper, WY 82601



ALLEN & CROUCH

PETROLEUM ENGINEERS

RECEIVED

JUN 5 2019

DEPT OF ENVIRONMENT & NATURAL
RESOURCES - RAPID CITY

June 5, 2019

Re: Request for Location Exception

T-C Oil Company, LLC 427 FM 774 Refugio, TX 78377

South Dakota Federal 7-1 (Confidential)

261' FNL & 513' FEL NE NE Section 7-T8S-R1E, Fall River County, South Dakota

Minerals and Mining Program Attention: Lucy Dahl

2050 West Main Street, Suite #1

Rapid City, SD 57702-2493

Dear Ms. Dahl:

Pursuant to the rules and regulations of the South Dakota Department of Environment & Natural Resources, T-C Oil Company, LLC Company hereby requests administrative approval for a location exception for the referenced wellbore. The reason for the exception is due to the geology and structural conditions for optimizing the location. T-C Oil Company has run extensive seismic across this area. If the location is not moved, we will miss our planned target. As a consequence, the South Dakota Federal 7-1 was moved to an acceptable surface location.

All of the mineral property within one-half mile of the location is owned or has been leased by T-C Oil Company, LLC. The legal survey plat and a map showing the location is attached.

If no objections are received, and if the supervisor is of the opinion that a hearing is unnecessary, please administratively approve this application. If you have any questions or need additional information, please call me at (307) 234-3571.

Sincerely,

Joe Rochelle, PE

Engineer for T-C Oil Company, LLC

Attachments

Cc: Gerald Freidrichs T-C Oil Company

Allen & Crouch Petroleum Engineer
646 River Cross Road, Casper, WY 82601
PO Box 976, Casper, WY 8260

307.234.3571
phone
307.234.9865 fax

STATE OF SOUTH DAKOTA
SECRETARY OF THE
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF T-C OIL COMPANY, LLC, REFUGIO, TX, FOR A PERMIT TO DRILL AN OIL AND GAS WELL AT AN EXCEPTION LOCATION TO STATEWIDE SPACING, DESCRIBED AS THE SOUTH DAKOTA FEDERAL 7-1 WELL, LOCATED 261 FEET FROM THE NORTH LINE AND 513 FEET FROM THE EAST LINE IN SECTION 7, TOWNSHIP 8 SOUTH, RANGE 1 EAST; APPROXIMATELY 11.9 MILES NORTHWEST OF EDMONT, FALL RIVER COUNTY, SD.

NOTICE
OF
RECOMMENDATION

OIL AND GAS
CASE NO. 5-2019

Notice is hereby given to the public and to all interested persons that pursuant to South Dakota Codified Laws (SDCL) Chapter 1-26 and Chapter 45-9 and further pursuant to the Administrative Rules of South Dakota (ARSD) 74:12:02:08 and 74:12:09, the following matter has come to the attention of the Secretary of the Department of Environment and Natural Resources, hereinafter "Secretary."

The Secretary recommends approval of the exception location for the following reasons:

1. The applicant asserts that drilling this well at the location prescribed by the statewide spacing rule would likely result in a well unable to produce in economic quantities, as indicated by three dimensional seismic interpretation.
2. No other producing or drilled oil and gas wells are located within 1,000 feet of the proposed location.

Authority for the Secretary to approve this application is contained in ARSD 74:12:02:08 and 74:12:09. Unless a person files a petition requesting a hearing on the above application pursuant to the provisions of ARSD 74:09:01 on or before July 3, 2019, the Secretary's recommendation will be considered final and the Secretary will approve the application in accordance with that recommendation.

The application and notice of recommendation are also posted on the department's website at: <http://denr.sd.gov/des/og/pubhearing.aspx> and <http://denr.sd.gov/public>. Additional information about this application is available from Mike Lees, Administrator, Minerals and Mining Program, Department of Environment and Natural Resources, 523 East Capitol Avenue, Pierre, SD 57501, telephone (605) 773-4201, email michael.lees@state.sd.us.

June 7, 2019



Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.

RECEIVED

MAY 28 2019

T8S, R1E

DEPT OF ENVIRONMENT & NATURAL
RESOURCES - RAPID CITY

FOUND STONE
NW. COR.
SEC. 7, T8S, R1E
LAT: 43.376571
LON: -104.054636

S 87°46'50" E 5157.93' (M)
LAT: 43.376612
LON: -104.045149

SET ALUM. CAP
P.L.S. NO. 13484
NE. COR.
SEC. 7, T8S, R1E
LAT: 43.376653
LON: -104.035235

SOUTH DAKOTA FEDERAL 7-1
UNGRADED ELEV= 3856.5'
SURFACE POSITION

LAT: 43.369359
LON: -104.054593

N 02°19'13" E 5256.95' (M)

LOT 1

LOT 2

LOT 3

LOT 4

SURFACE POSITION
NAD 83
STPC (SDS)
N: 401,949'
E: 984,113'
LAT: 43° 22' 33.349"N
(43.375930°N)
LON: 104° 02' 13.811"W
(104.037170°W)

SURFACE POSITION
NAD 27
STPC (SDS)
N: 401,949'
E: 1,015,714'
LAT: 43° 22' 33.447"N
(43.375957°N)
LON: 104° 02' 12.062"W
(104.036684°W)

LAT: 43.369419
LON: -104.035152

N 02°04'14" E 5274.50' (M)

FOUND STONE
SW. COR.
SEC. 7, T8S, R1E
LAT: 43.362147
LON: -104.054551

LAT: 43.362166
LON: -104.044988
S 87°35'12" E 5180.92' (M)

SET ALUM. CAP
P.L.S. NO. 13484
SE. COR.
SEC. 7, T8S, R1E
LAT: 43.362184
LON: -104.035068

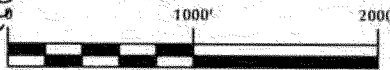
CERTIFICATE OF SURVEYOR

I, WRANGLER GROHS, A LICENSED PROFESSIONAL LAND SURVEYOR IN THE STATE OF SOUTH DAKOTA, DO HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM FIELD NOTES DURING AN ACTUAL SURVEY OF THE LAND DESCRIBED. NECESSARY LOCATIONS WERE MARKED BY ME OR UNDER MY SUPERVISION AND THAT THE LOCATION AND LEGAL DESCRIPTION PRESENTED FROM THE SURFACE POSITION ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

WRANGLER J. GROHS

WRANGLER GROHS
PROFESSIONAL LAND SURVEYOR
SOUTH DAKOTA REGISTRATION NUMBER 13484

Date 4/24/19



HORIZONTAL
SCALE: 1" = 1000'

NOTES:

- ▲ INDICATES SECTION CORNER.
- INDICATES CALCULATED CORNER.
- SECTION CORNER LATITUDES AND LONGITUDES ARE NAD83 (2011)(EPOCH:2010).
- ELEVATION BASED ON NAVD88 (GEOID12B).
- BASIS OF BEARING IS FROM SOUTH DAKOTA COORDINATE SYSTEM NAD83, SOUTH ZONE, U.S. SURVEY FEET.
- ALL MEASURED DISTANCES ARE GRID. COMBINED SCALE FACTOR: .99972955 CALCULATED FROM THE NW. CORNER OF SECTION 7, T8S, R1E.

WELL LEGAL PLAT

SOUTH DAKOTA FEDERAL 7-1
261' FNL & 516' FEL (SURFACE POSITION)
NE1/4 NE1/4, SECTION 7
T8S, R1E, B.H.M.
FALL RIVER COUNTY, SOUTH DAKOTA

Prepared For:

HC

T-C OIL COMPANY, LLC
427 FM 774
REFUGIO, TEXAS 78377



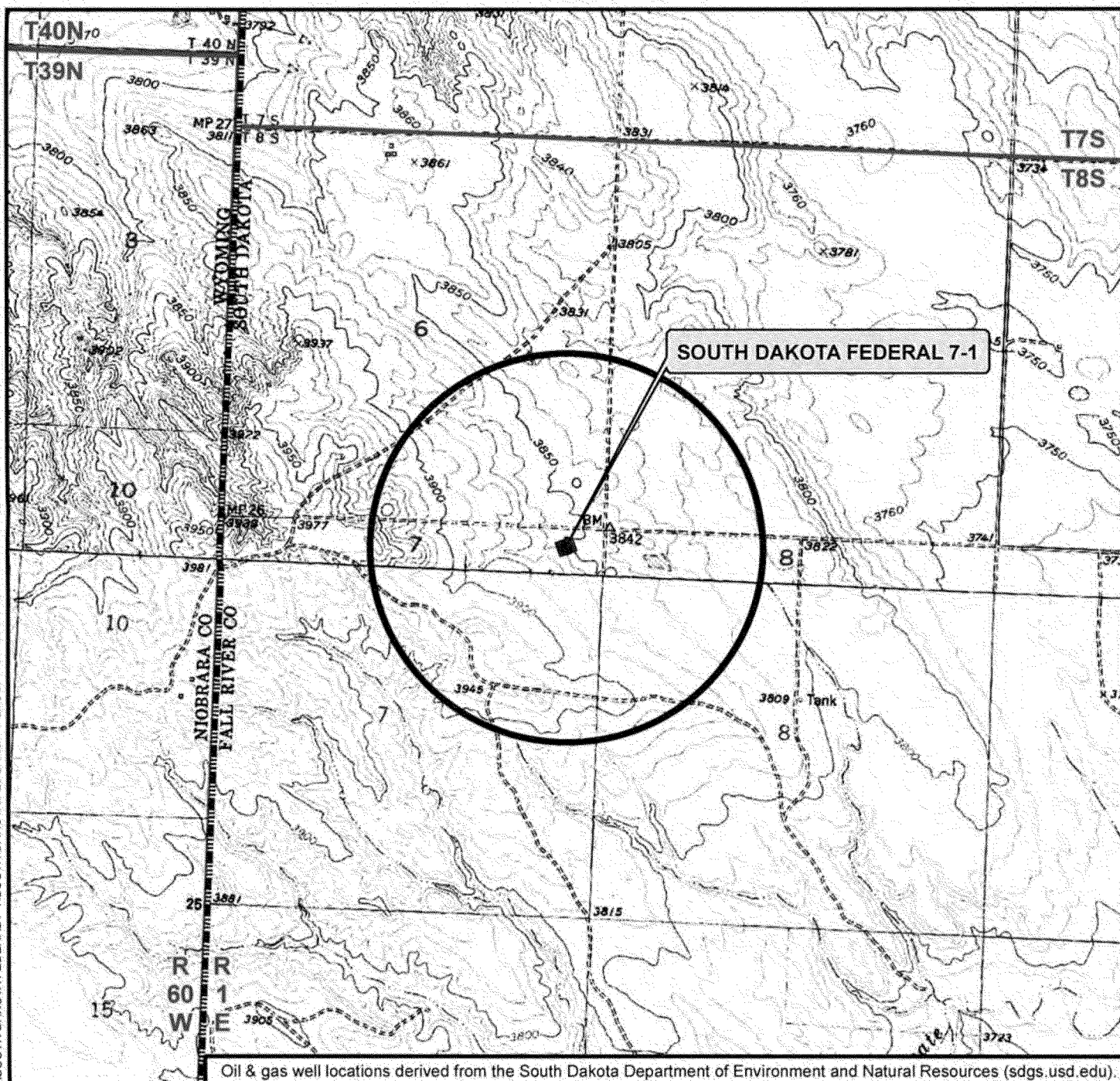
CONSULTING, LLC

1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609
Fax 307-674-0182

| | | |
|-----------------------|-----------------------|-------------|
| DRAFTED BY: SJM | CHECKED BY: WJC | SHEET NO: 1 |
| DATE DRAFTED: 4/24/19 | DATE SURVEYED: 4/4/19 | 1 OF 1 |
| REVISED: | FILE NAME: 18-225 | |

K:\17-00118-021, SOUTH DAKOTA, SEC. 7, T8S, R1E, B.H.M., 4/27/2019 11:04:37 AM, saved

K:\T-C OIL\18-225_SOUTH_DAKOTA_SECT_7-T8S_R1E\GIS\Maps_ABCD\SOUTH DAKOTA FEDERAL 7-1\SOUTH DAKOTA FEDERAL 7-1 EXCEPTION LOCATION MAP.mxd 4/22/2019 10:54:08 AM



Oil & gas well locations derived from the South Dakota Department of Environment and Natural Resources (sdgs.usd.edu).

Legend

- Well - Proposed
- Well Pad - Proposed
- Half-Mile Radius
- Injecting
- Producing
- Shut In
- Spudded
- Temporarily Abandoned
- Plugged and Abandoned

RECEIVED

MAY 28 2019

DEPT OF ENVIRONMENT & NATURAL RESOURCES
EXCEPTION LOCATION MAP

SOUTH DAKOTA FEDERAL 7-1
LOCATED IN NENE OF SECTION 7
T8S, R1E, B.H.M.
FALL RIVER COUNTY, SOUTH DAKOTA

Prepared For:

HC

T-C OIL COMPANY, LLC
427 FM 774
REFUGIO, TEXAS 78377



CONSULTING, LLC
1095 Saberton Avenue
Sheridan, Wyoming 82801
Phone 307-674-0609
Fax 307-674-0182

SCALE: 1" = 2,000ft

NAD83 SD-Sft

DRAWN: TL

DATE: 18 Apr 2019

REVISED:

DATE:

SHEET NO:

1

1 OF 1

ATTACHMENT 9



Seagull Environmental Technologies, Inc.

3555 Chase Street
Wheat Ridge, CO 80212
www.seagullenvirotech.com

September 24, 2014

Victor Ketellapper, Site Assessment Team Leader
U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Preliminary Assessment Report regarding the Darrow/Freezeout/Triangle Uranium Mine Site near Edgemont, South Dakota
EPA ID: SDN000803095
EPA Region 8 START 8(a) Carve-Out Contract EP-S8-11-05, Task Order 0014
Task Monitor: Victor Ketellapper, Site Assessment Team Leader

Dear Mr. Ketellapper:

Seagull Environmental Technologies, Inc. (Seagull) is pleased to submit the attached Preliminary Assessment report regarding the Darrow/Freezeout/Triangle Uranium Mine site near Edgemont, South Dakota. Please contact the Project Manager via email at rlunt@seagullenvirotech.com or by phone at (720) 459-7874 if you have any questions.

Sincerely,

Ryan M. Lunt
Task Order Project Manager

Hieu Q. Vu, PE
EPA Region 8 START 8(a) Program Manager

Enclosures

PRELIMINARY ASSESSMENT REPORT

Regarding the

DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

NEAR EDMONT, SOUTH DAKOTA

EPA ID: SDN000803095

Contract No.: EP-S8-11-05

Task Order No.: 0014

Prepared By:



SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.
3555 CHASE STREET
WHEAT RIDGE, COLORADO 80202-1129

September 24, 2014

Preliminary Assessment Report
Darrow/Freezeout/Triangle Uranium Mine Site
Edgemont, South Dakota

Title: START 8(a) Carve-Out Contract

PRELIMINARY ASSESSMENT REPORT APPROVED BY:



Hieu Q. Vu, PE, Program Manager

September 24, 2014

Date



Lynn Parman, PG, CHMM, QA/QC Manager

September 24, 2014

Date



Ryan M. Lunt, CHMM, Task Order Project Manager

September 24, 2014

Date



Victor Ketellapper, EPA Region 8, Site Assessment Team Leader

Sept 24 2014

Date

DISTRIBUTION LIST

U.S. ENVIRONMENTAL PROTECTION AGENCY

Victor Ketellapper (1 Copy)

Site Assessment Team Leader

SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.

Hieu Q. Vu (1 Copy)

Program Manager, START 8(a) Carve-Out, EPA Region 8

File (1 Copy)

START 8(a) Carve-Out, EPA Region 8

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Appendix

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1.0 INTRODUCTION

Under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Carve-Out 8(a) Contract (No. EP-S8-11-05), Task Order No. 0014, Seagull Environmental Technologies, Inc. (Seagull) has been tasked to conduct a Preliminary Assessment (PA) of the Darrow/Freezeout/Triangle Uranium Mine site (the Site) near Edgemont, Custer and Fall River Counties, South Dakota. This PA is to determine whether the site poses a threat to human health and the environment and if further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted.

This PA was conducted in accordance with *Guidance for Performing Preliminary Assessments Under CERCLA* (EPA 1994). The Site is listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database as EPA ID SDN000803095. The CERCLIS non-National Priorities List (NPL) status of the site as of February 7, 2014, was “Ongoing Preliminary Assessment” (EPA 2014a).

2.0 OBJECTIVES

Objectives of this PA were to:

- Evaluate existing information and analytical data.
- Assess presence, quantity, or absence of uranium-mine-related contaminants at the Site.
- Document any releases to the environment from the Site.
- Acquire information regarding exposure pathways, surrounding population density, and other target data, including environmentally sensitive receptors (wetlands, fisheries, and threatened or endangered species).
- Assess whether the Site warrants further investigation under CERCLA.
- Identify data gaps or limitations of existing data reviewed in this PA.

3.0 SITE LOCATION AND DESCRIPTION

The Site is near Edgemont, in Custer and Fall River Counties, South Dakota. Geographic coordinates at the approximate center of the site are 43.478486 degrees north latitude and 103.962746 degrees west longitude. Currently used primarily for cattle grazing, the Site encompasses approximately 1,426 acres at the southwest edge of the Black Hills uplift approximately 13 miles northwest of Edgemont, South Dakota (see Figures 1 and 2).

The Site lies within the proposed Dewey-Burdock in-situ uranium recovery (ISR) project area. ISR is a means of extracting uranium from underground ore bodies through a series of injection and production

wells, and pumping it to the surface for production of nuclear fuel (Powertech Uranium Corporation [Powertech] 2014). In 2009, Powertech submitted the Dewey-Burdock Project Application Technical Report in order to obtain a U.S. Nuclear Regulatory Commission (NRC) Uranium Recovery License for working within the Proposed Action Area (PAA) (Powertech 2009). The PAA boundary encompasses approximately 10,580 acres of mostly private land, including a series of sequentially developed well fields, a satellite ion exchange facility, a central processing plant, and associated facilities to recover and process the final uranium product. The NRC prepared a draft Supplemental Environmental Impact Statement (SEIS) to evaluate potential environmental impacts from proposed construction, operation, aquifer restoration, and decommission of an ISR uranium facility at the proposed site (NRC 2012). The Final Environmental Impact Statement (EIS) was completed in January 2014 (NRC 2014a). The technical report completed by Powertech included results of baseline sampling within the PAA. Sampling data from the area of the Site obtained during that effort were used for this PA to evaluate conditions at the Site. Mining waste remains in abundance at the Site, and is suspected to be a source of radionuclide contamination to nearby streams and groundwater (see Figure 2).

The site is within the Great Plains physiographic province, where vegetation is a mix of short grasses and shrubs typical of semi-arid steppe land, along with Ponderosa Pine forest toward the Black Hills. Most of the surrounding land is used for rangeland (Powertech 2009).

3.1 SITE HISTORY

The Site is an abandoned uranium mine. Uranium was discovered in the Edgemont area in 1952 (Powertech 2009). Early mining of the material was limited to surface deposits; however, later drilling revealed deeper deposits. In the mid-1970s, the Tennessee Valley Authority (TVA) purchased a major interest in the Edgemont area and hired Silver King Mines, Inc., to explore the property. However, in the mid-1980s, the operation was halted due to an economically unsustainable decline in uranium prices. In 1994, Energy Fuels Nuclear (EFN) acquired the property but relinquished it due to low uranium prices. Surface land rights and mineral rights in the site area belong to private owners and the U.S. government (Powertech 2012a, b).

A number of uranium mine sites have been investigated under Superfund authority, as these sites can present potential for (1) public exposure to radon and other radionuclides, (2) contamination of groundwater and surface water supplies (via acid drainage and mobilization of heavy metals), (3) natural habitat disturbance, (4) increased instability of the land via erosion and slope stability failure, and (5) other physical safety hazards. Therefore, these sites may pose a threat to nearby human health and the environment (EPA 2007).

3.2 CURRENT SITE CONDITIONS

During a site reconnaissance on November 5, 2013, Seagull team members and EPA traveled along public roads in the vicinity of the Site in an unsuccessful attempt to identify a vantage point from which to view the Site. Photos of the area of the Site—including drainage areas, historical points of interest, and current conditions of the surrounding area—were taken during this site reconnaissance (see Appendix A). START and EPA visited Edgemont City Hall to meet with local officials to discuss purposes of the PA and to obtain information for the report. Following the meeting with local officials, the City Engineer/Code Administrator of Edgemont accompanied START and EPA to visit areas of interest in and around Edgemont, including the nearby uranium mill tailings repository and location of the former mill. The visit also included travel to current City of Edgemont Public Water Supply (PWS) wells to confirm their locations.

4.0 SITE CHARACTERISTICS

The following sections discuss the geology and hydrogeology, hydrology, and meteorology of the site vicinity.

4.1 GEOLOGY AND HYDROGEOLOGY

The Site is within the Black Hills; soils within the Site's boundaries are generally clayey or silty, with patches of sandy loam on upland areas and clay in or near drainages. The level upland areas have deep soils, and shallow soils are on hills, ridges, and breaks (NRC 2012). Wide areas of unconsolidated alluvial and terrace deposits of Quaternary age overlie the sedimentary rocks of Cretaceous and Jurassic age. The sedimentary rocks include the Cretaceous-age Belle Fourche Shale, Graneros Group (Mowry Shale and Skull Creek Shale), and Inyan Kara Group (Fall River and Lakota Formations). The Fall River Formation consists of sandstone, siltstone, and interbedded sandstone and shale. The Lakota Formation consists of the Fuson Member (shale and siltstone with discontinuous sandstone) and Chilson Member (interbedded shale and sandstone, and a basal mudstone). The Chilson Member is also known as the Lakota Sandstone (Schnabel 1963, NRC 2012).

The Jurassic-age Morrison and Sundance Formations underlie the Inyan Kara Group. The Morrison Formation consists of shale and claystone interbedded with limestone. The Sundance Formation is composed of the Stockade Beaver Member (shale), Hulett Member (sandstone), Lak Member (sandstone, siltstone, and mudstone), and Redwater Member (shale) (Schnabel 1963).

Many occurrences of uranium minerals have been prospected within the Burdock quadrangle. Generally, the ore minerals occur as impregnations in sandstone, siltstone, and mudstone beds, but not consistently

in a carbonaceous environment. Uranium and vanadium minerals from these deposits have been identified as uraninite, carnotite, and tyuyamunite. Corvusite and rauvite are probably present in some of the deposits, although these have not been positively identified. The uranium minerals are restricted to the sandstone and sandy or silty facies in the Fall River Formation and the sandstone in the Chilson Member of the Lakota Formation (Schnabel 1963).

Major aquifers in the Black Hills area include (from top to bottom) the Inyan Kara Group, Minnekahta, Minnelusa, Madison, and Deadwood aquifers (see Appendix B). These aquifers are separated by confining layers with low permeability, except where they outcrop (NRC 2012). The Inyan Kara Group aquifer ranges from 250 to 500 feet thick and contains two subaquifers, the Fall River aquifer and Chilson aquifer, which are separated by the Fuson Shale. Aquifer pumping tests have provided data indicating a hydraulic connection between the Lakota and Fall River Formations through the intervening Fuson Shale in the Burdock area (NRC 2012). The Inyan Kara Group aquifer is separated from the Minnekahta aquifer by the Morrison Formation (60 to 140 feet thick), Sundance/Unkpapa aquifer (a minor aquifer), Gypsum Spring Formation, and the Spearfish Formation (320 feet thick). The Minnekahta aquifer ranges in thickness from 25 to 65 feet. Underlying the Minnekahta aquifer is the Opeche Shale (a confining layer) and the Minnelusa aquifer. The Minnelusa aquifer ranges in thickness from 375 to 1,175 feet. Confining layers are present at the base of the Minnelusa Formation; however, locally, these confining layers may be absent or provide ineffective confinement from the underlying Madison aquifer. The Madison aquifer is the most important aquifer in the region, supplying municipal water for numerous communities, including Rapid City and Edgemont, South Dakota. The Madison Formation is 200 to 1,000 feet thick and mainly consists of a dolomite unit characterized by fractures and karst features. The Madison aquifer is separated from the underlying Deadwood aquifer by the low-permeability Whitewood, Winnipeg, and Englewood Formations (NRC 2012). With the exception of Edgemont, which has two municipal wells in the Madison aquifer, the deeper aquifers are not used as a source of water in the area (Powertech 2009).

The hydrogeologic setting in the Black Hills area also involves minor aquifers, which include the Sundance/Unkpapa, Newcastle, and alluvial aquifers. These minor aquifers yield small volumes of water locally for domestic and stock uses. Alluvial aquifers with thicknesses of 0 to 50 feet are along Beaver Creek, Pass Creek, and the Cheyenne River. They are typically unconfined, but may be confined locally. Alluvial aquifers are separated from the underlying Fall River Formation by the low-permeability Graneros Group confining unit. An alluvial drilling program completed in 2012 did not indicate any areas of discharge to the alluvium along Beaver Creek and Pass Creek from the underlying Fall River aquifer (NRC 2012).

Groundwater in the Fall River and Chilson aquifers flows from northeast to southwest. Regionally, groundwater flows radially outward from the Black Hills toward the surrounding plains (NRC 2012).

Groundwater Levels

Regionally, groundwater levels in alluvial aquifers range from 14.4 to 22.5 feet below ground surface (bgs). Groundwater levels in the Fall River aquifer range from 80 to 680 feet bgs. Groundwater levels in the Chilson aquifer range from 196 to 1,000 feet bgs (Powertech 2009).

4.2 HYDROLOGY

The site lies within the Pass Creek sub-watershed, which comprises most of the east-southeast portion of the larger Beaver Creek watershed. The site is drained by Pass Creek and its tributaries. Located adjacent and east of the site, Pass Creek is an intermittent creek with periods of high runoff following major storm events. No permanent stream flow gages are stationed along Pass Creek (Powertech 2009). Pass Creek flows southwest from the northwest boundary of the Site approximately 6 stream miles to Beaver Creek. Approximately 5.5 stream miles southeast of the confluence of Pass and Beaver Creeks, Beaver Creek flows into the Cheyenne River (Google Earth 2013). In 2013, the mean annual discharge from the Cheyenne River was 38.2 cubic feet per second (cfs), according to a gaging station in Edgemont, downstream of its confluence with Beaver Creek (U.S. Geological Survey [USGS] 2014).

4.3 METEOROLOGY

According to the High Plains Regional Climate Center's (HPRCC) station in Edgemont, the average maximum and minimum annual temperatures in the site area are 61.2 and 33.1 degrees Fahrenheit (°F), respectively. The annual average precipitation is 15.79 inches (HPRCC 2014).

5.0 PREVIOUS ANALYTICAL DATA

Analytical data from groundwater, surface water, sediment, soil, and air were collected within the study area by Powertech and were included in the Dewey-Burdock Project Application for NRC Uranium Recovery License Technical Report (Powertech 2009). These data were referenced in the Environmental Impact Statement (EIS) completed by the NRC.

5.1 GROUNDWATER

The following sections address groundwater sampling and results of that sampling.

5.1.1 Groundwater Sampling

According to a well inventory conducted by Powertech, the following wells are within a 4-mile radius of the Site boundary: one domestic well and five stock wells are within the Site boundary; one domestic well is within 0.25 mile of the Site; one domestic well and four stock wells are between 0.25 and 0.50 mile of the Site; one domestic well and six stock wells are within 0.50 and 1 mile of the Site; 12 stock wells are between 1 and 2 miles of the Site; eight domestic wells, 10 stock wells, and one irrigation well are between 2 and 3 miles of the Site; and six domestic and 10 stock wells are between 3 and 4 miles of the Site (Figure 3).

Powertech conducted groundwater sampling of wells at the proposed Dewey-Burdock ISR project area from October 2006 through February 2009 (see Figure 4). Groundwater samples were collected from domestic, stock, irrigation, monitoring, and temporary wells, the majority of which were downgradient of the Site. Groundwater samples were collected from wells in various aquifers: 17 wells were in the Fall River Formation, 19 wells were in the Lakota Formation (Chilson Member), two wells were in the Inyan Kara Group, three wells were in the Unkpapa Formation, two wells were in unknown aquifers, one well was in the Sundance Formation, and five wells were in alluvium. Generally, groundwater samples were collected for analysis for water quality parameters: major ions; metals, including mercury (total, suspended, and dissolved); and radionuclides (total, suspended, and dissolved).

USGS also conducted groundwater sampling in the Dewey-Burdock area during June 2011. USGS collected 28 groundwater samples from monitoring wells in and around the Dewey-Burdock site that were screened in multiple aquifers.

During July 2012, American Engineering and Testing, Inc. installed additional alluvial groundwater monitoring wells in the area of the Site to supplement the groundwater monitoring results included in the initial application submitted to NRC by Powertech. The additional wells were compliance point wells within the alluvial aquifers along Beaver Creek and Pass Creek (see Figure 5). The wells were sampled monthly by Powertech from July 2012 to June 2013. Most of the samples were analyzed for water quality measurements, metals (including mercury), and dissolved radionuclides.

5.1.2 Groundwater Analytical Results Summary

Groundwater sampling results indicated that in 36 of 49 samples, at least one analyte exceeded the Maximum Contaminant Level (MCL). Of 38 groundwater samples collected from the proposed ore-bearing aquifer, 28 contained analyte concentrations exceeding at least one MCL for drinking water (NRC 2012). The designated crossgradient background well (Well 650) contained concentrations of the

contaminants of concern, including total and dissolved radium-226 (Ra-226) (3.2/2.7 picocuries per liter [pCi/L]), total and dissolved uranium (0.4/1.9 micrograms per liter [$\mu\text{g/L}$]), and dissolved gross alpha (13.1 pCi/L). None of these background concentrations exceeded its MCL.

Samples collected from Wells 615, 684, and 3026, which were screened within the Chilson aquifer, exceeded the MCL for arsenic (0.01 milligram per liter [mg/L]); Wells 650 and 689, also within the Chilson aquifer, exceeded the EPA action level for lead (0.015 mg/L). Samples from Well 622 in the Fall River aquifer and from Wells 676 and 679 in alluvial aquifers along Pass Creek exceeded the MCL for arsenic and EPA action level for lead. Samples from Wells 681 and 688 in the Fall River aquifer exceeded the MCL for arsenic. The MCL for uranium (30 $\mu\text{g/L}$) was exceeded in samples collected from four of five wells sampled in the alluvial aquifers. Samples from Wells 42, 680, 684, and 3026 in the Chilson aquifer and Well 698 in the Fall River aquifer also exceeded the MCL for uranium. No MCLs for other metals were exceeded in any of the groundwater samples (NRC 2012).

Approximately 50 percent of the samples collected from the Fall River and Chilson aquifers for analysis for dissolved Ra-226 exceeded the MCL of 5 pCi/L. Dissolved Ra-226 levels exceeding the MCL ranged between 5.2 and 1,440 pCi/L. Approximately 75 percent of the samples collected from wells in the Fall River, Chilson, and alluvial aquifers for analysis for dissolved gross alpha exceeded the MCL of 15 pCi/L. Gross alpha levels exceeding the MCL in alluvial wells ranged between 18.3 and 129 pCi/L; however, gross alpha levels exceeding the MCL in the Fall River and Chilson aquifers were higher, ranging from 15.1 to 6,730 pCi/L. Samples from wells 16, 619, 680, 688, and 692 contained dissolved Ra-226 ranging from 6.4 to 1,440 pCi/L, and dissolved gross alpha concentrations ranging from 17.3 to 6,730 pCi/L exceeding their respective MCLs; these wells are within a 1-mile radius of the Site boundary, and are crossgradient or downgradient of the Site.

A primary drinking water standard for radon-222 (Rn-222) has not been established; however, EPA has proposed a limit of 300 pCi/L (EPA 2000). Of samples from all the wells tested during baseline groundwater sampling, only the sample from Well 650 (background) did not exceed the proposed EPA limit; Well 650 is screened in the Chilson aquifer, and is crossgradient of the Site (NRC 2012).

Concentrations of Rn-222 found to exceed the EPA's proposed limit for Rn-222 ranged from 11,247 to 17,092,120 Becquerels per cubic meter (Bq/m^3) (304 to 462,000 pCi/L). Wells 680 and 42 in the mapped ore bodies in the Chilson aquifer, and Well 681 in the Fall River aquifer, contained the highest concentrations of Rn-222. Well 42 provides water for domestic use and stock water (NRC 2012).

Groundwater samples collected from all domestic wells except Well 8 contained concentrations of at least one analyte that exceeded its MCL. Groundwater samples exceeding MCLs for uranium (total and

dissolved), Ra-226 (total and dissolved), dissolved gross alpha, and arsenic, and the EPA action level for lead, are listed in Table 1.

TABLE 1
GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009

| Well ID | Aquifer | Well Description | Ra-226 (Total) (pCi/L) | Ra-226 (Dissolved) (pCi/L) | Uranium (Total) (µg/L) | Uranium (Dissolved) (µg/L) | Gross Alpha (Dissolved) (pCi/L) | Arsenic (mg/L) | Lead (mg/L) |
|---------|------------|-----------------------|------------------------|----------------------------|------------------------|----------------------------|---------------------------------|----------------|---------------|
| 2 | Chilson | Domestic/Stock | -- | -- | -- | -- | -- | -- | -- |
| 4 | Unknown | Stock | -- | -- | -- | -- | -- | -- | -- |
| 5 | Fall River | Stock | -- | -- | -- | -- | -- | -- | -- |
| 7 | Fall River | Domestic | -- | -- | -- | -- | 15.5 – 17.0 | -- | -- |
| 8 | Fall River | Domestic | -- | -- | -- | -- | -- | -- | -- |
| 13 | Chilson | Domestic | -- | -- | -- | -- | 19.5 | -- | -- |
| 16 | Chilson | Domestic | 17.4 | 6.4 – 33.6 | -- | -- | 28.3 – 110 | -- | -- |
| 18 | Fall River | Domestic | -- | 5.8 | -- | -- | 15.7 – 37.0 | -- | -- |
| 41 | Unknown | Stock | -- | 16.5 | -- | -- | 88 | -- | -- |
| 42 | Chilson | Domestic | 79.7 | 87.6 – 102 | -- | 32.4 – 40 | 371 – 560 | -- | -- |
| 49 | Fall River | Stock | -- | -- | -- | -- | -- | -- | -- |
| 615 | Chilson | Monitoring | -- | 7.2 | -- | -- | 15.1 – 38.3 | 0.021 – 0.024 | -- |
| 619 | Chilson | Stock | 120 | 99.7 – 120 | -- | -- | 341 – 438 | -- | -- |
| 622 | Fall River | Monitoring | -- | 7.9 | -- | -- | 22.6 – 1,470 | 0.027 | 0.023 – 0.03 |
| 628 | Inyan Kara | Stock | 6.8 | 6.1 – 20.7 | -- | -- | 29.9 – 83.9 | -- | -- |
| 631 | Fall River | Stock | 15.2 | 9.5 – 22.1 | -- | -- | 46.5 – 162 | -- | -- |
| 635 | Sundance | Stock | -- | -- | -- | -- | -- | -- | -- |
| 650 | Chilson | Stock (background) | -- | -- | -- | -- | -- | -- | 0.05 |
| 675 | Alluvial | Alluvial | -- | -- | 38.7 – 50.2 | 30.7 – 49.3 | 18.3 – 55.2 | -- | -- |
| 676 | Alluvial | Alluvial | -- | -- | 59.1 – 68.7 | 49.4 – 58.6 | 31.9 – 95.5 | 0.021 | 0.06 |
| 677 | Alluvial | Alluvial | -- | -- | 41.4 – 47.1 | 40.2 – 45.0 | 38.7 – 129 | -- | -- |
| 678 | Alluvial | Alluvial | -- | -- | 37.9 – 38.7 | 34.9 – 36.8 | 18.9 – 54.7 | -- | -- |
| 679 | Alluvial | Alluvial (background) | -- | -- | -- | -- | 18.4 – 22.4 | 0.011 | 0.015 – 0.022 |

TABLE 1 (Continued)

GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009

| Well ID | Aquifer | Well Description | Ra-226 (Total) (pCi/L) | Ra-226 (Dissolved) (pCi/L) | Uranium (Total) (µg/L) | Uranium (Dissolved) (µg/L) | Gross Alpha (Dissolved) (pCi/L) | Arsenic (mg/L) | Lead (mg/L) |
|---------|------------|------------------|------------------------|----------------------------|------------------------|----------------------------|---------------------------------|----------------|-------------|
| 680 | Chilson | Test Well | -- | 1,110 – 1,440 | 54.1 | 30.3 – 172 | 4,090 – 6,730 | -- | -- |
| 681 | Fall River | Test Well | -- | 258 – 445 | -- | -- | 656 – 2,220 | 0.024 | -- |
| 682 | Chilson | Monitoring | -- | -- | -- | -- | 50.3 | -- | -- |
| 683 | Fall River | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 684 | Chilson | Monitoring | -- | 543 | 336 | 66.7 | 1890 | 0.04 | -- |
| 685 | Fall River | Monitoring | -- | -- | -- | -- | 23.8 | -- | -- |
| 686 | Chilson | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 687 | Fall River | Monitoring | -- | 25.7 | -- | -- | 114 | -- | -- |
| 688 | Fall River | Test Well | -- | 6.7 – 7.9 | -- | -- | 17.3 – 29.8 | 0.015 | -- |
| 689 | Chilson | Test Well | -- | 5.4 – 7.9 | -- | -- | 23.9 – 64.3 | -- | 0.017 |
| 690 | Unkpapa | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 691 | Fall River | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 692 | Chilson | Monitoring | -- | 484 | -- | -- | 1450 | -- | -- |
| 693 | Unkpapa | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 694 | Fall River | Domestic | -- | -- | -- | -- | 20.2 – 23.9 | -- | -- |
| 695 | Fall River | Stock | -- | 5.2–6.3 | -- | -- | 15.9 – 52.2 | -- | -- |
| 696 | Chilson | Domestic | -- | -- | -- | -- | 15.1 – 25.9 | -- | -- |
| 697 | Chilson | Stock | -- | 5.6 | -- | -- | 18.2 – 21.7 | -- | -- |
| 698 | Fall River | Weather Station | -- | 347 – 429 | 101 – 132 | 99.8 – 119 | 36.3 – 2,110 | -- | -- |
| 703 | Unkpapa | Domestic | -- | -- | -- | -- | 42.6 | -- | -- |
| 704 | Chilson | Monitoring | -- | -- | -- | -- | -- | -- | -- |
| 705 | Chilson | Monitoring | -- | -- | -- | -- | -- | -- | -- |

TABLE 1 (Continued)
GROUNDWATER DATA SUMMARY
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
JULY 2007 THROUGH FEBRUARY 2009

| Well ID | Aquifer | Well Description | Ra-226 (Total) (pCi/L) | Ra-226 (Dissolved) (pCi/L) | Uranium (Total) (µg/L) | Uranium (Dissolved) (µg/L) | Gross Alpha (Dissolved) (pCi/L) | Arsenic (mg/L) | Lead (mg/L) |
|------------|------------|------------------|------------------------|----------------------------|------------------------|----------------------------|---------------------------------|----------------|--------------------------|
| 706 | Fall River | Monitoring | -- | -- | -- | -- | 20.5 – 56.3 | -- | -- |
| 3026 | Chilson | Stock | -- | 9.5 – 10.4 | 32.2 | -- | 15.4 – 116 | 0.022–0.044 | -- |
| 4002 | Inyan Kara | Stock | 62.7 | 52.3 – 63.6 | -- | -- | 120 – 314 | -- | -- |
| 7002 | Chilson | Stock | 6.3 | 8.0 – 8.8 | -- | -- | 29.5 – 91.4 | -- | -- |
| MCL | | | 5 | 5 | 30 | 30 | 15 | 0.01 | 0.015^a |

Source: Powertech 2012c

Notes:

- ^a EPA action level
-- Below the MCL or not analyzed
ID Identification
MCL Maximum Contaminant Level
mg/L Milligrams per liter
pCi/L Picocuries per liter
Ra-226 Radium-226
µg/L Micrograms per liter

Samples collected by USGS from Wells 676 and 678 (also sampled by Powertech), which were screened in the alluvial aquifer along Pass Creek, exceeded the MCL for uranium. Additionally, a sample collected from Well 698 (also sampled by Powertech), screened in the Fall River aquifer and immediately downstream of runoff from the Site, also exceeded the MCL for uranium (Johnson 2012).

Samples collected by Powertech from monitoring wells in 2012 and 2013 contained concentrations of gross alpha that exceeded its MCL (15 pCi/L). Well BC1, downgradient of the Site, was the only well that contained a concentration of uranium above its MCL. As previously mentioned, a primary drinking water standard for Rn-222 has not been established; however, EPA has proposed a limit of 300 pCi/L (EPA 2000). All groundwater samples collected from the alluvial monitoring wells contained concentrations of Rn-222 that exceeded 300 pCi/L. A summary of groundwater results from the alluvial monitoring wells in the area of the Site is in Table 2 below.

TABLE 2
MONITORING WELL SUMMARY DATA
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2012-2013

| Well ID | Sample Location | Ra-226 (pCi/L) | Uranium (pCi/L) | Gross Alpha (pCi/L) |
|----------------|------------------------|---------------------------|----------------------------|------------------------------------|
| BC1 | Pass Creek watershed | -- | 75.7 – 111 | 50.1 – 108 |
| BC2 | Pass Creek watershed | -- | -- | 20.0 – 38.9 |
| BC3 | Pass Creek watershed | -- | -- | 19.3 – 43.5 |
| DC1 | Beaver Creek watershed | -- | -- | 15.9 – 88.7 |
| DC2 | Beaver Creek watershed | -- | -- | 20.7 – 41.7 |
| DC3 | Beaver Creek watershed | -- | -- | -- |
| DC4 | Beaver Creek watershed | -- | -- | 16.5 – 29.6 |
| MCL | | 5 | 30 | 15 |

Source: Powertech 2013

Notes:

-- Below the MCL or not analyzed
ID Identification
MCL Maximum Contaminant Level
pCi/L Picocuries per liter
Ra-226 Radium-226

5.2 SURFACE WATER AND SEDIMENT

The following sections address analytical data from surface water and sediment samples collected at the study area. Sample locations are shown on Figure 6.

5.2.1 Surface Water Sampling

Surface water samples were collected monthly between July 2007 and June 2008 from perennial and ephemeral streams near the area of the Site. The perennial streams, Beaver Creek and the Cheyenne River, were each sampled at two locations. The ephemeral streams included Pass Creek, Bennett Canyon, and an unnamed tributary (see Figure 6). Passive samplers were installed at the ephemeral stream locations to collect samples during flow events. Two sample locations were on Pass Creek, while samples were to be collected at one location each at Bennet Canyon and the unnamed tributary (Powertech 2009). The Bennet Canyon sample location was absent of water during both sampling periods.

Surface water samples were also collected at impoundment locations in the area of the Site during 2007-2008. In all, 48 impoundments had been identified on aerial photographs and topographic maps prior to field activities and were subsequently field-verified. A subset of 11 impoundments were chosen from the total of 48, based on presence of water during sampling activities and spatial distribution of the impoundments. The locations included the Darrow Pit, Triangle Pit, and nine other impoundments (see Figure 6). Some of the impoundments on the site meet the definition of “surface impoundment” described in Hazard Ranking System (HRS) Table 2-5, indicating they could also be evaluated as potential sources of contamination for HRS scoring purposes (EPA 2011).

5.2.2 Surface Water Analytical Results Summary

Total gross alpha concentrations were detected at all seven sample locations and ranged from 1.9 to 65.8 pCi/L. The highest concentration was detected in a sample collected at the downstream Beaver Creek location. Total and dissolved uranium were detected in every sample except the one collected from the unnamed tributary. The highest concentrations of total uranium (37.8 µg/L) and dissolved uranium (36.8 µg/L) were in a sample collected at the downstream Cheyenne River location. Total and dissolved Ra-226 were detected at concentrations ranging from 0.2 to 5.1 pCi/L. The highest detections occurred in samples collected at the downstream sample locations on Beaver Creek and the Cheyenne River. Total and dissolved Pb-210 were detected at concentrations up to 35 pCi/L. The highest concentration was detected at the upstream sample location on Beaver Creek.

Samples collected at downstream locations on Beaver Creek and Pass Creek met observed release criteria by containing analytes that exceeded three times background concentrations. The sample collected downstream on Pass Creek contained elevated concentrations of gross alpha (8.8 pCi/L), and total and dissolved uranium (25.2/5.0 µg/L), meeting observed release criteria. The sample collected downstream on Beaver Creek contained elevated concentrations of gross alpha (65.8 pCi/L); however, the

concentration did not meet observed release criteria. Additionally, a sample collected at the downstream location on the Cheyenne River contained an elevated concentration of Pb-210 (22.0 pCi/L) that met observed release criteria. However, that downstream sampling location on the Cheyenne River was beyond the 15-mile Target Distance Limit (TDL).

Analytical results from surface water samples are listed in Table 3 (Powertech 2012). To summarize the surface water data, the highest downstream detections of each analyte are listed with the corresponding upstream sample results from the same sampling event. For example, the highest concentration of total gross alpha at the downstream Beaver Creek location was detected in a sample collected on November 19, 2007 (65.8 pCi/L at BVC01). Therefore, the total gross alpha concentration detected in the upstream Beaver Creek sample collected on November 19, 2007 (34.7 pCi/L at BVC04), is also listed in the table. The date on which concentrations of Pb-210 were detected at the Cheyenne River downstream location had no counterpart date of Pb-210 data acquisition at the upstream location; thus data obtained on the date of upstream data acquisition closest to the date of data acquisition at the downstream location were used for the comparison. No Superfund Chemical Data Matrix (SCDM) benchmarks have been established for radionuclides in surface water.

TABLE 3
RADIOLOGICAL DATA FOR SURFACE WATER SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2007-2008

| Sample Location | Sample Description | Gross Alpha Total (pCi/L) | Uranium (µg/L) | | Ra-226 (pCi/L) | | Pb-210 (pCi/L) | |
|-----------------|---------------------------|---------------------------|----------------|-----------|----------------|-----------|----------------|-----------|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| BVC04 | Beaver Creek–upstream | 34.7 | 6.1 | 5.6 | 2.2j | -0.06j | 35 | 26 |
| BVC01 | Beaver Creek–downstream | 65.8 | 26.2 | 26.9 | 5.1 | 2.0 | 14.0 | 11.0 |
| CHR01 | Cheyenne River–upstream | 35.3 | 32.0 | 30.8 | 4.1 | 0.06j | <1 | <1 |
| CHR05 | Cheyenne River–downstream | 29.9 | 37.8 | 36.8 | 5.1 | 1.4 | 22.0 | <1 |
| PSC02 | Pass Creek–upstream | 1.9 | 5.7 | 0.7 | <0.2 | NM | 0.0j | 1.7j |
| PSC01 | Pass Creek–downstream | 8.8 | 25.2 | 5.0 | 0.7 | NM | 3.0j | 2.2j |
| UNT01 | Unnamed Tributary | 6.1 | 0.9 | ND | 0.3 | 0.2 | NA | NA |

Source: Powertech 2012d

Notes:

Shaded result indicates the value exceeds three times the background (upstream) level (or above the detection limit if non-detect in the background sample).

| | | | |
|----|---|--------|--|
| < | Less than | NM | Not measured in field/not requested for analysis from laboratory |
| ID | Identification | Pb-210 | Lead-210 |
| j | Not detected above minimum detectable concentration | pCi/L | Picocuries per liter |
| NA | Not analyzed | Ra-226 | Radium-226 |
| ND | Non detect | µg/L | Micrograms per liter |

Samples collected from the Darrow Pit (Sub06) and the Triangle Mine Pit (Sub02) contained the highest radionuclide concentrations of the 11 impoundment samples. Total gross alpha was detected at 8,750 pCi/L at location Sub06 and 199 pCi/L at location Sub02. Total and dissolved uranium were detected at 7,380 and 7,840 pCi/L, respectively, at location Sub06, and at 190 and 177 pCi/L, respectively, at location Sub02. In addition, samples collected at Sub01, Sub03, Sub04, Sub09, and Sub10 contained concentrations of total gross alpha ranging from 15.9 to 19.9 pCi/L. Samples collected from Sub01, Sub06, and Sub08 through Sub11 contained concentrations of total Pb-210 ranging from 1.1 to 8.2 pCi/L. Samples collected from Sub02, Sub08, and Sub11 contained concentrations of dissolved

Pb-210 ranging from 1.5 to 4.6 pCi/L. Maximum results for each surface water impoundment in the area of the Site are listed in Table 4.

TABLE 4

**RADIOLOGICAL DATA FOR SURFACE WATER IMPOUNDMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2007-2008**

| Sample Location | Sample Description | Gross Alpha Total (pCi/L) | Uranium (µg/L) | | Ra-226 (pCi/L) | | Pb-210 (pCi/L) | |
|-----------------|-----------------------------|---------------------------|----------------|-----------|----------------|-----------|----------------|-----------|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| Sub01 | Stock pond | 16.2 | 2.0 | 0.3 | 1.2 | 0.5 | -1.4 j | 0.7 |
| Sub02 | Triangle Mine Pit | 199 | 190 | 177 | 0.6 | 0.7 | 0.5 | 0j |
| Sub03 | Mine dam | 19.9 | 3.1 | 2.3 | 4.0 | 4.5 | -3.8j | -3.0j |
| Sub04 | Stock pond | 13.6 | 2.4 | 2.1 | 3.5 | 3.4 | -3.0j | -2.1j |
| Sub05 | Mine dam | NS | NS | NS | NS | NS | NS | NS |
| Sub06 | Darrow Mine Pit - Northwest | 8,750 | 7,380d | 7,840 | 2.0 | 4.3 | 3.1 | -0.6j |
| Sub07 | Stock dam | 5.8 | 1.3 | 2.4 | 0.8 | 0.8 | -0.8j | -1.4j |
| Sub08 | Stock pond | 14.1 | 2.3 | 2.8 | 0.5 | 0.5 | 5.3 | 4.6 |
| Sub09 | Stock pond | 15.9 | 2.3 | 5.6 | 0.5 | 0.1 | 3.6 | -0.9j |
| Sub10 | Stock pond | 16.3 | 3.3 | 2.7 | 1.2 | 0.2 | 5.3j | 0.1 |
| Sub11 | Stock pond | 9.4 | 1.6 | 33.6d | 0.9 | 0.7 | 8.2 | 3.2 |

Source: Powertech 2012d

Notes:

| | | | |
|----|---|--------|--------------------------------------|
| < | Less than | NS | Not sampled because no water present |
| d | Reporting limit increased due to sample matrix interference | Pb-210 | Lead-210 |
| ID | Identification | pCi/L | Picocuries per liter |
| j | Not detected above minimum detectable concentration | Ra-226 | Radium-226 |

5.2.3 Sediment Sampling

Sediment samples were collected by Powertech at collocated surface water sample locations previously cited in Section 5.2.1 (see Figure 6). At each location, four sample aliquots were collected by use of a plastic hand trowel to a depth of 5 centimeters (cm), along a transect spanning the width of the channel in areas where sediment had been deposited. The aliquots were then composited into a single sample to represent the average radionuclide concentration across the channel (Powertech 2009).

Additional sediment samples were collected in the area of the Site from on-site impoundments described in Section 5.2.1. At each location, a single sample was collected by use of a trowel to a depth of 5 cm. Samples were collected near the edge of the water at locations appearing relatively undisturbed. At dry impoundments, sediment samples were collected within areas determined likely to be submerged if water would be present (Powertech 2009). The sediment samples were analyzed for natural uranium, Ra-226, thorium-230 (Th-230), and Pb-210 (Powertech 2009).

5.2.4 Sediment Analytical Results Summary

Samples collected at the downstream Pass Creek location (PSC01) exceeded three times background concentrations for all analytes, thereby meeting observed release criteria. Additionally, a sample collected at the downstream Cheyenne River location (CHR05) exceeded three times the background level for uranium, thereby meeting observed release criteria. Table 5 summarizes analytical results from sediment samples collected at locations on Pass Creek, Beaver Creek, the Cheyenne River, Bennet Canyon, and an unnamed tributary.

TABLE 5
RADIOLOGICAL DATA FROM STREAM SEDIMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2008

| Sample Location | Sample Description | Sample Date | U-nat Total (mg/kg-dry) | Ra-226 Total (pCi/g-dry) | Pb-210 Total (pCi/g-dry) | Th-230 Total (pCi/g-dry) |
|-----------------|---------------------------|-------------|-------------------------|--------------------------|--------------------------|--------------------------|
| BEN01 | Bennet Canyon | 6/23/2008 | 1.8 | 0.6 | 2.3U | 0.6 |
| | | 8/21/2008 | 2.4 | 0.6 | 2.0 | 0.5 |
| BVC04 | Beaver Creek-upstream | 6/17/2008 | 2.0 | 1.5 | 1.9U | 0.7 |
| | | 8/21/2008 | 2.0 | 1.0 | 1.8 | 1.0 |
| BVC01 | Beaver Creek-downstream | 6/17/2008 | 2.0 | 1.3 | 0.5U | 0.8 |
| | | 8/21/2008 | 2.0 | 0.6 | 2.6 | 1.2 |
| CHR01 | Cheyenne River-upstream | 6/17/2008 | 1.7 | 1.0 | 0.2U | 0.6 |
| | | 8/21/2008 | 2.7 | 0.9 | 1.7 | 1.4 |
| CHR05 | Cheyenne River-downstream | 6/17/2008 | 6.2 | 2.1 | 1.7U | 1.9 |
| | | 8/21/2008 | 1.2 | 0.6 | 1.3 | 0.5 |
| PSC02 | Pass Creek-upstream | 6/17/2008 | 1.1 | 0.6 | 1.2U | 0.4 |
| | | 8/21/2008 | 1.0 | 0.4 | 0.4U | 0.4 |
| PSC01 | Pass Creek-downstream | 6/17/2008 | 3.9 | 2.9 | 4.7 | 2.0 |
| | | 8/21/2008 | 6.5 | 1.8 | 4.0 | 4.1 |
| UNT01 | Unnamed Tributary | 6/23/2008 | 2.0 | 0.8 | 2.2U | 0.5 |
| | | 8/21/2008 | 2.5 | 0.7 | 1.7 | 1.0 |

Source: Powertech 2009

Notes:

Shaded result indicates the value exceeds three times the background (upstream) level (or above the detection limit if non-detect in the background sample).

ID Identification
mg/kg Milligrams per kilogram
NE Not established
Pb-210 Lead-210
pCi/g Picocuries per gram

Ra-226 Radium-226
Th-230 Throium-230
U Analyte not detected at or above the reporting limit
U-nat Natural uranium

Uranium concentrations in samples from the Darrow Mine Pit – Northwest (Sub06) and Triangle Mine Pit (Sub02) ranged from 18 to 37 mg/kg. Samples from two mine dams (Sub03 and Sub05) and one stock pond (Sub04) contained concentrations of uranium ranging from 4.2 to 8.5 mg/kg. Samples collected from Sub02, Sub05, and Sub06 contained concentrations that exceeded three times background concentrations of uranium, Ra-226 and Th-230, meeting observed release criteria. The sample collected at location Sub03 also contained a concentration of Ra-226 that exceeded three times background, meeting observed release criteria. The sample quantitation limit (SQL) for Pb-210 could not be confirmed through laboratory data information, and therefore the data could not be used to establish an

observed release. Table 6 summarizes analytical results from sediment samples collected at impoundment locations throughout the area of the Site.

TABLE 6
RADIOLOGICAL DATA FOR IMPOUNDMENT SEDIMENT SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2008

| Sample Location | Location Description | Sample Date | U-nat Total (mg/kg-dry) | Ra-226 Total (pCi/g-dry) | Pb-210 Total (pCi/g-dry) | Th-230 Total (pCi/g-dry) |
|--------------------|-----------------------------|-------------|-------------------------|--------------------------|--------------------------|--------------------------|
| Sub01 (background) | Stock pond | 6/18/2008 | 2.2 | 1.2 | 0.5U | 0.7 |
| | | 8/21/2008 | 3.3 | 1.1 | 1.0U | 1.0 |
| Sub02 | Triangle Mine Pit | 6/18/2008 | 18 | 3.9 | 2.8U | 2.9 |
| | | 8/21/2008 | 19 | 1.3 | 3.1 | 6.8 |
| Sub03 | Mine dam | 6/18/2008 | 7.2 | 4.1 | 3.9 | 2.1 |
| | | 8/21/2008 | 4.2 | 1.1 | 3.2 | 1.9 |
| Sub04 | Stock pond | 6/17/2008 | 6.5 | 2.5 | 1.2U | 0.9 |
| | | 8/21/2008 | 5.1 | 0.7 | 2.1 | 1.8 |
| Sub05 | Mine dam | 6/18/2008 | 8.5 | 4.2 | 4.2 | 2.4 |
| | | 8/21/2008 | 6.0 | 3.0 | 2.8 | 2.3 |
| Sub06 | Darrow Mine Pit – Northwest | 6/23/2008 | 37 | 8.6 | 9.6 | 7.8 |
| | | 8/21/2008 | 32 | 5.2 | 4.0 | 5.9 |
| Sub07 | Stock dam | 6/23/2008 | 1.7 | 0.7 | 0.6U | 0.5 |
| | | 8/21/2008 | 2.2 | 0.4 | 1.9 | 0.9 |
| Sub08 | Stock pond | 6/23/2008 | 1.2 | 0.6 | 0.6U | 0.4 |
| | | 8/21/2008 | 1.9 | 0.4 | 1.7 | 0.8 |
| Sub09 | Stock pond | 6/23/2008 | 2.4 | 1.0 | 1.5U | 0.7 |
| | | 8/21/2008 | 2.3 | 0.6 | 1.7 | 0.9 |
| Sub10 | Stock pond | 6/23/2008 | 1.5 | 0.8 | 1.5U | 0.7 |
| | | 8/21/2008 | 2.1 | 0.6 | 0.9U | 0.7 |
| Sub11 | Stock pond | 6/23/2008 | 2.7 | 0.8 | 2.1U | 0.5 |
| | | 8/21/2008 | 1.8 | 0.6 | 1.5 | 0.8 |

Source: Powertech 2009

Notes:

Shaded result indicates a concentration that exceeds three times the background level (sample results from June 18, 2008)

ID Identification
mg/kg Milligrams per kilogram
Pb-210 Lead-210
pCi/g Picocuries per gram
Ra-226 Radium-226
Th-230 Thorium-230
U Analyte not detected at or above the reporting limit
U-nat Natural uranium

5.3 SOIL

The following sections address soil sampling and analytical results from soil sampling.

5.3.1 Soil Sampling

Powertech conducted soil sampling within the proposed Dewey-Burdock permit area, which included the area of the Site. Surface soil samples were collected from the top 15 cm by use of a hand shovel. All of the soil samples were analyzed for Ra-226. In all, 25 samples were collected at the area of the Site (Powertech 2009).

5.3.2 Soil Analytical Results Summary

Samples SMA-B01 through SMA-B29 (not consecutive) were collected at the area of the Site (see Figure 7). Sample SMA-B01 was the designated background sample. The sample results were compared to SCDM cancer risk (CR) screening levels for ingestion of soil, and the health-based standard of 5.0 pCi/g for Ra-226 in surface soil (15 pCi/g for subsurface soil) based on the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. That standard was developed for cleanup of radiation-contaminated soil, specifically uranium mill tailings sites. An EPA memorandum dated February 12, 1998, clarifies use of the UMTRCA soil cleanup standard for CERCLA sites (EPA 1998). The purpose of the standard was to limit risk from inhalation of radon decay products in houses built on mine tailings, and to limit gamma radiation exposure to people using contaminated land. The standard was developed to control the hazard from gamma radiation; therefore, this standard may be appropriate and relevant to CERCLA sites (EPA 1998).

Samples SMA-B03, -B07, -B09, -B10, -B11, -B13, -B14, -B15, -B19, -B21, and -B23 through -B30 contained concentrations of Ra-226 that exceeded the SCDM CR screening level of 1.0 pCi/g. Samples SMA-B26 through -B30, collected near the Triangle Mine Pit area and the Darrow Mine Pit, contained concentrations exceeding both the SCDM CR benchmark for Ra-226 and the UMTRCA standard for surface soil for Ra-226 of 5.0 pCi/g. Samples SMA-B07, -B23, -B26, -B28, and -B30 contained concentrations of Ra-226 at or above three times background (0.9 pCi/g), meeting observed release criteria. The exact location of sample SMA-B28 could not be confirmed from the source map produced by Powertech. In addition, samples SMA-B27 and -B29 contained concentrations of natural uranium (U-nat), Pb-210, and Th-230 at concentrations exceeding three times background, also meeting observed release criteria. Table 7 summarizes the surface soil sample analytical results.

TABLE 7
RADIOLOGICAL DATA FROM SURFACE SOIL SAMPLES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2012

| Sample ID | Sample Date | Ra-226 (pCi/g) | U-nat (pCi/g) | Pb-210 (pCi/g) | Th-230 (pCi/g) |
|---|-------------|-------------------|------------------|-------------------|-------------------|
| SMA-B01(background) | 9/24/2007 | 0.9 | 1.2 | 0.6 | 0.5 |
| SMA-B03 | 9/24/2007 | 1.5 | - | - | - |
| SMA-B04 | 9/24/2007 | 1.0 | - | - | - |
| SMA-B07 | 9/24/2007 | 3.2 | - | - | - |
| SMA-B09 | 9/24/2007 | 1.2 | - | - | - |
| SMA-B10 | 9/25/2007 | 1.4 | - | - | - |
| SMA-B11 | 9/24/2007 | 2.3 | - | - | - |
| SMA-B13 | 9/25/2007 | 1.7 | - | - | - |
| SMA-B14 | 9/24/2007 | 1.4 | - | - | - |
| SMA-B15 | 9/24/2007 | 1.6 | - | - | - |
| SMA-B16 | 9/24/2007 | 0.8 | - | - | - |
| SMA-B17 | 9/24/2007 | 0.9 | - | - | - |
| SMA-B18 | 9/25/2007 | 0.5 | - | - | - |
| SMA-B19 | 9/24/2007 | 1.2 | - | - | - |
| SMA-B20 | 9/27/2007 | 0.9 | - | - | - |
| SMA-B21 | 9/24/2007 | 1.4 | - | - | - |
| SMA-B22 | 9/24/2007 | 0.8 | - | - | - |
| SMA-B23 | 9/24/2007 | 2.7 | - | - | - |
| SMA-B24 | 9/24/2007 | 1.3 | - | - | - |
| SMA-B25 | 9/24/2007 | 1.1 | - | - | - |
| SMA-B26 | 9/28/2007 | 11 | - | - | - |
| SMA-B27 | 9/28/2007 | 40 | 67 | 30 | 30 |
| SMA-B28 | 9/29/2007 | 6.4 | - | - | - |
| SMA-B29 | 9/28/2007 | 29 | 16 | 20 | 20 |
| SMA-B30 | 9/28/2007 | 34 | - | - | - |
| SCDM Cancer Risk (ingestion) | | 1.0 | 3.7* | NE | 3.0 |
| UMTRCA Standard for Surface Soil | | 5.0 | 30* | NE | NE |

Source: Powertech 2009

Notes:

Bold result indicates a concentration that exceeds the SCDM or UMTRCA benchmark.

Shaded result indicates a concentration that exceeds three times the background level.

| | | | |
|--------|---------------------------|--------|---|
| * | Uranium-238 concentration | pCi/g | Picocuries per gram |
| - | Not analyzed | Ra-226 | Radium-226 |
| ID | Identification | SCDM | Superfund Chemical Data Matrix |
| NA | Not applicable | Th-230 | Thorium-230 |
| NE | Not established | UMTRCA | Uranium Mill Tailings Radiation Control Act |
| Pb-210 | Lead-210 | U-nat | Natural uranium |

Powertech conducted baseline radiological surveys and sampling in the area of the Site between August 2007 and July 2008 to characterize and quantify radiation levels and radionuclide concentrations in soils. Within the surface mine area, external gamma exposure rates ranged from 5.9 to 324 microrentgens per hour ($\mu\text{R/hr}$). Elevated readings were associated with the abandoned open pit mines, waste rock, and drainages in the surface mine area (Powertech 2009). Background external gamma exposure rates near the Site were approximately 5.0 $\mu\text{R/hr}$ (USGS 1993). Gamma exposure rates within the area of the Site exceeded three times the background, meeting observed release criteria. Table 8 summarizes gamma exposure rates in surface soil in the mine area.

TABLE 8
EXTERNAL GAMMA EXPOSURE RATES IN SURFACE SOIL IN MINE AREA
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE
2007-2008

| Parameter | Gamma-Ray Count Rate ($\mu\text{R/hr}$) |
|--------------------|---|
| Mean | 13.8 |
| Standard Deviation | 18.4 |
| Median | 10.9 |
| Minimum | 5.9 |
| Maximum | 324.1 |
| Background | 5.0* |

Sources: Powertech 2009, USGS 1993

Notes:

* Approximate
 $\mu\text{R/hr}$ Microrentgens per hour

5.4 AIR

The following sections address air sampling and analytical results from air sampling.

5.4.1 Air Sampling

Powertech conducted air monitoring and sampling within the area of the Site during three monitoring periods: August 18, 2007 to February 4, 2008; February 4 to May 17, 2008; and May 17 to July 17, 2008. Ambient exposure rates were measured by use of thermo luminescent dosimeters (TLD) placed at eight locations throughout the Dewey-Burdock site; however, five of the TLDs deployed were lost due to suspected disturbance by livestock in the area.

In addition, Radtrak passive track etch detectors were placed at each of those air monitoring locations, and at an additional eight biased locations to measure radon-222 (Rn-222) concentrations in air. The measurement events were separated into four quarterly periods as follows: August 14 to September 27, 2007; September 27, 2007, to February 1 through 12, 2008; February 1 through 12, 2008, to May 17, 2008; and May 17 to July 17, 2008 (Powertech 2009).

5.4.2 Air Sampling Results Summary

The associated annualized dose rates ranged from 114 to 323 mrem/yr. Typical ranges of average worldwide exposures are 60 to 160 mrem/yr (Powertech 2009).

Ambient radon monitoring results were as follows: Period 1 concentrations ranged from 1.0 to 9.8 pCi/L, with an average of 2.4 pCi/L; Period 2 concentrations ranged from 0.4 to 1.8 pCi/L, with an average of 1.2 pCi/L; Period 3 concentrations ranged from 0.4 to 3.3 pCi/L, with an average of 1.8 pCi/L; Period 4 concentrations ranged from 0.5 to 0.8 pCi/L, with an average of 0.5 pCi/L. In terms of effluent limits, the measured values exceeded the 10 *Code of Federal Regulations* (CFR) Part 20 limit of 0.1 pCi/L for Rn-222 with daughters present (Powertech 2009).

6.0 SOURCES OF CONTAMINATION AND WASTE CHARACTERISTICS

The source areas at the Site were geo-referenced to establish an approximate boundary and area of the four mine waste piles within the site boundary (see Figure 8). Waste Pile #1 (approximately 941,651.45 ft²) is near the Triangle Mine Pit in the northwest portion of the site. Waste Pile #2 (approximately 11,037.49 ft²) is 0.25 mile east of Pile #1. Waste Pile #3 (approximately 1,372,012.21 ft²) is in the north central portion of the site. Waste Pile #4 (approximately 8,552,514.66 ft²) is near the Darrow Mine Pit in the southeast portion of the site. The combined area of the waste piles is approximately 10,877,215 ft² (see Figure 8). Radionuclides are the contaminants of concern, including natural uranium, Ra-226, Th-230, and Pb-210. Natural uranium is uranium containing the following relative concentrations of isotopes found in nature: uranium-235 (0.7 %), uranium-238 (99.3 %), and uranium-234 (trace amounts) (NRC 2014b). These radionuclides are present across the area of the Site, and migration of these off site into nearby surface water bodies has been documented. Surface soil samples near the open pits and mine waste piles have contained significantly elevated concentrations of radionuclides, exceeding UMTRCA standards and three times background concentrations.

Uranium, radium, and radon are naturally occurring. Chronic (long-term) inhalation exposure to uranium and radon in humans has been linked to respiratory effects such as chronic lung disease, while radium exposure has resulted in acute leukopenia, anemia, necrosis of the jaw, and other effects. Cancer is the

major effect of concern from exposure to radium via oral exposure, which is known to cause bone, head, and nasal passage tumors in humans. Uranium may cause lung cancer and tumors in lymphatic and hematopoietic tissues (EPA 2000).

7.0 PATHWAY ANALYSIS

This section discusses contaminant migration pathways evaluated under the HRS. A CERCLA Eligibility Checklist (Appendix B) and a Potential Hazardous Waste Preliminary Assessment Form (Appendix C) have been completed for the PA. Additionally, site risks and pathways of concern have been presented in a Conceptual Site Model (Appendix D).

7.1 GROUNDWATER PATHWAY AND TARGETS

Radiological results from samples indicate that groundwater in the area of the Site contains concentrations of radionuclides that exceed MCLs for uranium, Ra-226, and gross alpha. In addition, some wells contain concentrations of lead and arsenic that exceed the EPA action level for lead and MCL for arsenic. The majority of the samples exceeding these standards were collected from the Inyan Kara Group aquifer. This aquifer ranges from 250 to 500 feet thick and contains two subaquifers—the Fall River aquifer and Chilson aquifer—which are separated by the Fuson Shale. Data from aquifer pumping tests indicate a hydraulic connection between the Lakota and Fall River Formations through the intervening Fuson Shale in the Burdock area (NRC 2012). Samples collected from the alluvial aquifer in the area of the Site have also contained elevated concentrations of radionuclides. Minor aquifers also occur within the Black Hills, including the Sundance/Unkpapa, Newcastle, and alluvial aquifers. These minor aquifers yield small volumes of water locally for domestic and stock uses. Alluvial aquifers with thicknesses of 0 to 50 feet are along Beaver Creek, Pass Creek, and the Cheyenne River. They are typically unconfined, but may be confined locally. Alluvial aquifers are separated from the underlying Fall River Formation by the low-permeability Graneros Group confining unit. An alluvial drilling program completed in 2012 did not indicate any areas of discharge to the alluvium along Beaver Creek and Pass Creek from the underlying Fall River aquifer (NRC 2012).

Groundwater in the Fall River and Chilson aquifers flows from northeast to southwest. Regionally, groundwater flows radially outward from the Black Hills toward the surrounding plains (NRC 2012). The Site is not within a wellhead protection area (South Dakota Department of Environment and Natural Resources [SDDENR] 2013).

According to a well inventory of the area of the Site conducted by Powertech, the following water wells are within a 4-mile TDL of the Site boundary (see Figure 9): one domestic well and five stock wells are

within the Site boundary; one domestic well is within 0.25 mile of the Site; one domestic well and four stock wells are within 0.25 and 0.50 mile of the Site; one domestic well and six stock wells are within 0.50 and 1 mile of the Site; 12 Stock wells are within 1 to 2 miles of the Site; eight domestic wells, 10 Stock wells, and one irrigation well are within 2 to 3 miles of the Site; and six domestic and 10 stock wells are within 3 to 4 miles of the Site. The Site is on the border of Custer and Fall River Counties; the average persons per household in Custer County is 2.17, and the average persons per household in Fall River County is 2.12. Based on the number of domestic wells and the average number of persons per household, approximately 15 people could obtain their water from private wells in Custer County within the 4-mile TDL. Approximately 23 people could obtain their water from private wells in Fall River County within the 4-mile TDL. Table 9 summarizes the drinking water target population in the area of the Site. This estimated population differs slightly from the data obtained for the 2010 census, which indicated fewer (approximately 29) people live within 4 miles of the approximate center of the Site (Mable/Geocorr12: Geographic Correspondence Engine with Census 2010 Geography [Mable/Geocorr] 2014).

TABLE 9
DRINKING WATER TARGET POPULATION
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

| Distance From Site | Number of Wells Within TDL | Population Served |
|--------------------|----------------------------|-------------------|
| On Site | 1 | 2.12 |
| 0 to .25 mile | 1 | 2.12 |
| 0.25 to 0.5 mile | 1 | 2.17 |
| 0.5 to 1 mile | 1 | 2.12 |
| 1 mile to 2 miles | 0 | 0 |
| 2 miles to 3 miles | 8 | 16.96 |
| 3 miles to 4 miles | 6 | 13.02 |
| Total | 18 | 38.51 |

Source: Mable/Geocorr 2014

Notes:

TDL Target distance limit

7.2 SURFACE WATER PATHWAY AND TARGETS

Hydrology associated with the Site is discussed in Section 4.2. The primary surface water bodies associated with the 15-mile TDL are Pass Creek, Beaver Creek, and the Cheyenne River (see Figure 8).

According to SDDENR, no potable water intakes are on Pass Creek, Beaver Creek, or the Cheyenne River within the 15-mile TDL. Beaver Creek and the Cheyenne River are used by recreational anglers;

however, documentation of the extent of use of the water bodies as fisheries is not available. All surface water bodies within the 15-mile TDL are used for fish and wildlife propagation, recreation, and stock watering. Pass Creek has been designated for irrigation use; however, because the stream is intermittent, insufficient data are available to determine whether Pass Creek actually has been used for irrigation. Beaver Creek, from its headwaters to the Cheyenne River, has been determined to be impaired or threatened due to potential impacts of detrimental specific conductance, total dissolved solids, and salinity in these waters on warm water semi-permanent fish life, fish and wildlife propagation, recreation, stock watering, and irrigation. In addition, the Cheyenne River, between its confluence with Beaver Creek and Cascade Creek, has also been found to present threats to fish and wildlife propagation, recreation, stock watering, irrigation, and warm water semi-permanent fish life because of detrimental specific conductance, total dissolved solids, total suspended solids, and salinity in those waters stemming from runoff from nearby livestock grazing areas, feeding operations, and/or crop production (SDDENR 2012b).

Wetlands have been identified within the area of the Site and downstream of the Site along Pass Creek within the 15-mile TDL. The wetlands within the area of the Site are primarily designated as Palustrine Emergent (PEM) or Palustrine Unconsolidated Shore (PUS), with modifiers identifying the wetlands as seasonally or temporarily flooded and excavated or diked/impounded features. In addition, the Triangle Mine Pit area includes a Palustrine Unconsolidated Bottom (PUB) intermittently exposed excavated feature. Downstream from the Site along Pass Creek are Palustrine Aquatic Bed (PAB) and PEM wetlands that are semi-permanently flooded (U.S. Fish and Wildlife Service [USFWS] 2014). The wetlands within the area of the Site do not meet actual shoreline (frontage) qualifications to be evaluated for HRS scoring (EPA 2013).

The segment of Beaver Creek downstream of its confluence with Pass Creek does not contain identified wetlands until its confluence with the Cheyenne River, where Riverine Lower Perennial Unconsolidated Bottom semi-permanently flooded (R2UBF) and Palustrine Emergent temporarily flooded (PEMA) wetlands exist. Along the Cheyenne River, classified wetlands include Riverine Lower Perennial Unconsolidated Shore temporarily flooded (R2USA), seasonally flooded (R2USC), R2UBF, and PEMA (USFWS 2014). PEMA wetlands on the Cheyenne River approximately 1.7 miles downstream of its confluence with Beaver Creek include approximately 0.23 mile of contiguous frontage, meeting eligibility requirements and size criteria to be evaluated for HRS scoring. Additional PEMA wetlands on the Cheyenne River occur approximately 2.9 miles downstream of its confluence with Beaver Creek, where approximately 0.14 mile of contiguous frontage exists, also meeting eligibility requirements and size criteria to be evaluated for HRS scoring. Other R2USA and R2USC wetlands are present along the

Cheyenne River; however, additional information is needed to determine whether these wetlands have been impacted by the Site. The previous downstream sample location on the Cheyenne River was outside of the 15-mile TDL; therefore, data from that location cannot be used to evaluate attribution of contamination to the Site for HRS scoring purposes (EPA 2014).

Threatened and endangered species known or likely to occur in Custer and Fall River Counties are listed in Table 10. Powertech conducted surveys of the proposed PAA (including the area of the Site), including a 1-mile perimeter of the area, for threatened and endangered species, bald eagle winter roosts, all nesting raptors, upland game bird leks, and big game. In addition to the surveys, incidental observations of all vertebrate wildlife species within the PAA were recorded during each site visit during the year-long baseline survey period. Surveys were also conducted within the PAA for other vertebrate species of concern tracked by the South Dakota National Heritage Program (SDNHP), as well as bats, small mammals, lagomorphs, prairie dog colonies, breeding birds, predators, and herptiles (reptiles and amphibians). All the surveys were conducted by qualified biologists using standard field equipment and appropriate field guides. The black-footed ferret and the greater sage-grouse are the only federally listed species known to occur in both Custer and Fall River Counties. No federally listed vertebrate species were documented within the project survey area. Surveys for the black-footed ferret were not required for this project due to a block-clearance issued by the USFWS that includes the entire PAA and vicinity. The only exception to that clearance is in Custer State Park in northern Custer County. Surveys were also conducted by TVA in the general vicinity of the PAA during fall 1977. No ferrets or evidence of their presence were observed during those historical surveys (Powertech 2009). The following federally listed threatened and endangered species listed in Table 10 possibly occur in the two counties or possibly migrate through the counties (USFWS 2013).

TABLE 10

**FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES
DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE**

| Common Name | Scientific Name | Status |
|-------------------------|----------------------------------|---------------------|
| Whooping Crane | <i>Grus americana</i> | Endangered |
| Red knot | <i>Calidris canutus rufa</i> | Proposed threatened |
| Sprague's pipit | <i>Anthus spragueii</i> | Candidate |
| Black-footed ferret | <i>Mustela nigripes</i> | Endangered |
| Northern Long-Eared Bat | <i>Myotis septentrionalis</i> | Proposed Endangered |
| Greater sage-grouse | <i>Centrocercus urophasianus</i> | Candidate |

Source: U.S. Fish & Wildlife Service 2013

The State of South Dakota has listed 23 vertebrate species as threatened or endangered. Only one of the species listed was documented within the PAA or 1-mile perimeter during the survey period (mid-July 2007 through early August 2008). One active bald eagle nest was observed within the northwestern portion of the revised permit area (SW ¼, Section 30, Township 6 South, Range 1 East). The nest was in a cottonwood tree along Beaver Creek, and reportedly fledged one young in 2008. The bald eagle was removed from the Federal List of Endangered and Threatened Wildlife on August 8, 2007. However, protection provided to the bald eagle under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act has continued after the species was delisted. The rule change does not affect the bald eagle's status as a threatened or endangered species under state laws, or suspend any other legal protections provided by state laws. In South Dakota, the bald eagle is still considered a threatened species. Bald eagles were repeatedly observed along Beaver Creek in the western portion of the PPA and perimeter during winter roost surveys in late 2007 and early 2008.

7.3 SOIL EXPOSURE AND AIR PATHWAYS AND TARGETS

Standards have been developed for cleanup of radiation-contaminated soil under UMTRCA of 1978 (40 CFR Part 192). The purpose of these standards was to limit risk from inhalation of radon decay products in houses built on mine tailings, and to limit gamma radiation exposure to people using contaminated land. UMTRCA specifies two cleanup standards based on concentrations of Ra-226: (1) surface soil cleanup to 5 pCi/g, and (2) subsurface soil cleanup to 15 pCi/g. An EPA memorandum dated February 12, 1998, clarifies use of these two UMTRCA soil cleanup standards for CERCLA sites (EPA 1998). The surface soil standard of 5 pCi/g for Ra-226 is a health-based standard developed to control the hazard from gamma radiation; therefore, this standard may be appropriate and relevant to CERCLA sites.

Air samples collected within the Site area contained concentrations of Ra-226 that exceeded the 10 CFR Part 20 limit of 0.1 pCi/L for Rn-222 with daughters present (Powertech 2009).

The land within the Site is privately owned and leased. Land use is primarily agricultural and for livestock grazing. Edgemont, the town nearest the Site (approximately 13 miles away), had an estimated population of 774 people in 2010 (U.S. Census 2010). The area surrounding the Site is primarily agricultural. Residents and people farming surrounding land are potential targets. Nobody resides within 200 feet of the Site. No residents are within 1 mile of the Site, and approximately 26 persons reside within the 4-mile TDL (Mable/Geocorr 2014). No daycare centers or schools are within 200 feet of the Site.

8.0 DATA GAPS

Most of the data reviewed for this PA were acquired and reported during the period of approximately 2006 to 2009. Some significant data gaps exist within the information reported. For the PA, source areas were estimated by tracing boundaries of waste piles and surface impoundments by reference to two-dimensional aerial imagery. Soil samples collected by Powertech within the area of the Site (Surface Mine Area [SMA-XX]) were all analyzed for Ra-226. However, of the 25 samples collected, only three were analyzed for additional radionuclides including uranium, Pb-210, and Th-230—the other known contaminants on site. Groundwater samples were collected within the area of the Site from various types of wells; however, lack of groundwater sampling data from near and upgradient of the Site limited availability of reliable background concentrations. Surface water samples were collected from multiple water bodies in the area of the Site, including Pass Creek, Beaver Creek, and the Cheyenne River. However, the downstream Pass Creek surface water sample location was upstream of the probable point of entry (PPE) for surface water migrating from the Site. Additionally, the downstream sample location on the Cheyenne River was beyond the 15-mile TDL (see Figure 8). Therefore, data acquired at that sample point could not be used to evaluate potential surface water impacts from the Site in this PA. Biological samples including fish were collected by Powertech to evaluate potential impacts on surface water bodies including Beaver Creek and the Cheyenne River. Beaver Creek and the Cheyenne River are used by recreational anglers; however, documentation of the extent of use of the water bodies as fisheries is not available. Uranium was detected in all fish collected during July 2008. The detections were interpreted to be the result of increased sample sizes of the species submitted for laboratory analysis. No detections of uranium occurred in samples collected during April 2008; however, the detection limit was higher during that sampling period due to matrix interferences. Pb-210, Th-230, and Ra-226 were detected, but at low concentrations in most samples. Pb-210 was detected in one specimen collected at the downstream Beaver Creek location; however, the precision of the result was questionable due to matrix interferences. Additional data are needed to determine whether the Site is impacting fish in water bodies downstream of the Site.

9.0 SUMMARY

The Site (EPA ID: SDN000803095) is 15 miles from Edgemont, in Custer and Fall River Counties, South Dakota. Geographic coordinates at the approximate center of the Site are 43.478486 degrees north latitude and 103.962746 degrees west longitude. The 1,426-acre Site is used primarily for cattle grazing. ISR is proposed as a possible future use of this site.

Sources

By reference to aerial imagery, approximate areas of mine waste piles were quantified. Surface soil near the mine waste piles has been determined to contain levels of radionuclides exceeding health-based benchmarks and exceeding three times background concentrations, meeting observed release criteria. Additionally, samples collected from impoundments within the area of the Site have contained elevated levels of radionuclides and could also be considered potential source areas for HRS evaluation. Radionuclides are the contaminants of concern, including uranium, Ra-226, Th-230, and Pb-210.

Groundwater Migration Pathway

Sampling results indicate an observed release to groundwater has occurred at the Site. According to results of groundwater sampling and a well inventory conducted by Powertech, 18 domestic wells are within a 4-mile radius of the site boundary. Wells 16 and 42 have contained concentrations of Ra-226 exceeding its MCL and meeting observed release criteria. Concentrations in other wells have been above background levels but have not met observed release criteria; therefore, those wells are subject to potential contamination.

Surface Water Migration Pathway

Sampling results indicate a release of radionuclides has occurred to Pass Creek, Beaver Creek, and the Cheyenne River. There are no known drinking water intakes within the 15-mile TDL. The Cheyenne River and Beaver Creek support fish life and possible food chain targets; however, the extent of use of the water bodies as fisheries is not available. Freshwater emergent and riverine wetlands are present along the riparian areas at the confluence of Beaver Creek and the Cheyenne River and downstream (along the Cheyenne River); however, it is unknown whether these sensitive environments have been impacted by releases from the site. Additional data are needed to properly evaluate the surface water pathway and confirm attribution to contaminants present at the Site.

Soil Exposure and Air Migration Pathways

Surface soil samples collected at the Site have contained elevated concentrations of radionuclides. Additionally, air samples have indicated elevated concentrations of Rn-222 within the area of the Site. However, because of the small number of targets in the immediate vicinity of the Site, those pathways pose limited threat to human health and the environment.

Conclusions

Additional surface soil sampling within the Site appears warranted to better characterize and define source areas. Additional data could be used to quantify source materials within the area of the Site, and volumes of waste piles should be measured more accurately. Additional sampling of surface water and

sediment also appears warranted to determine if releases from the Site are impacting downstream sensitive environments (i.e., wetlands and possible fish habitat).

9.1 EMERGENCY RESPONSE AND REMOVAL ACTION CONSIDERATIONS

Based on available data from previous site assessments by Powertech, a removal action appears warranted to address radium-226 contamination in mine waste piles at the Site. Five soil samples collected from the Site contained radium-226 concentrations that exceeded the EPA health-based standard of 5 pCi/g and exceeded three times background concentrations. Emergency response actions do not appear warranted at the Site.

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FIGURES

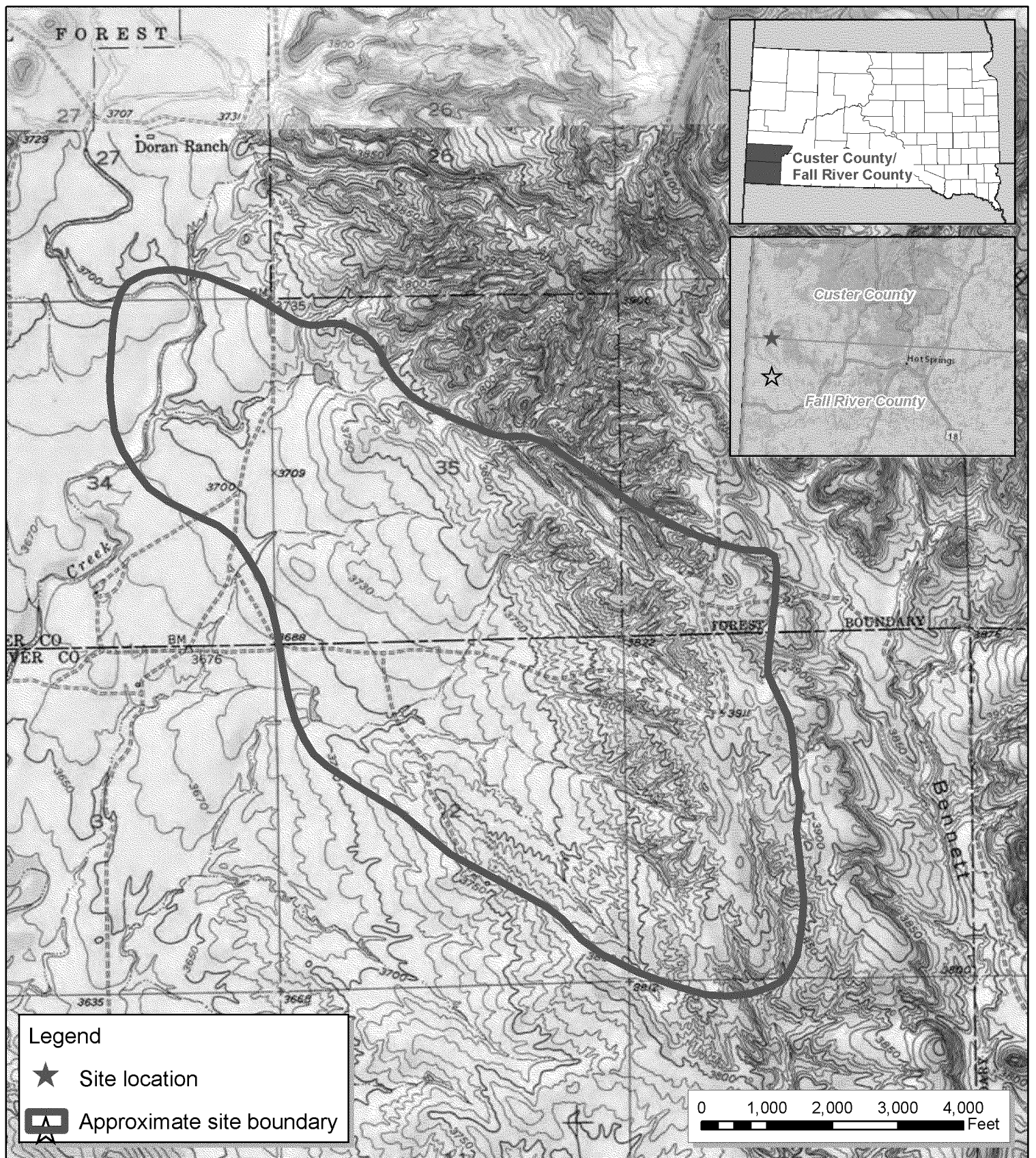
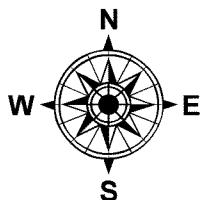


Figure 1
Site Location Map

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota

Seagull Environmental Technologies, Inc.



Source: ArcGIS Online, World Imagery, 2011

Project No: EPS81105.0014

Date: May 2014

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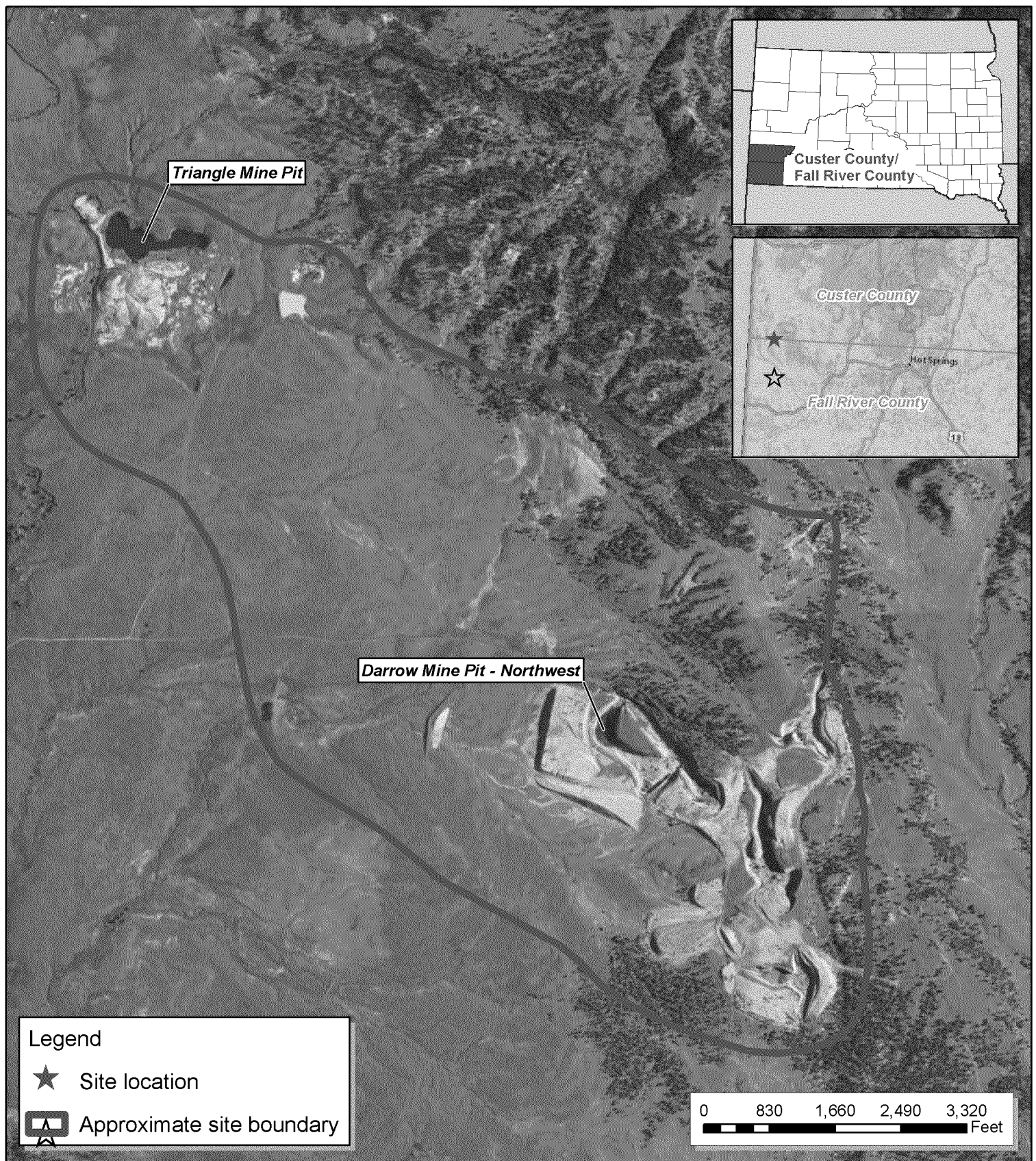
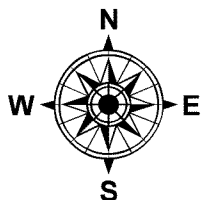


Figure 2
Site Layout Map

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.



Source: ArcGIS Online, World Imagery, 2011

Project No: EPS81105.0014

Date: May 2014

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Seagull Environmental Technologies, Inc.

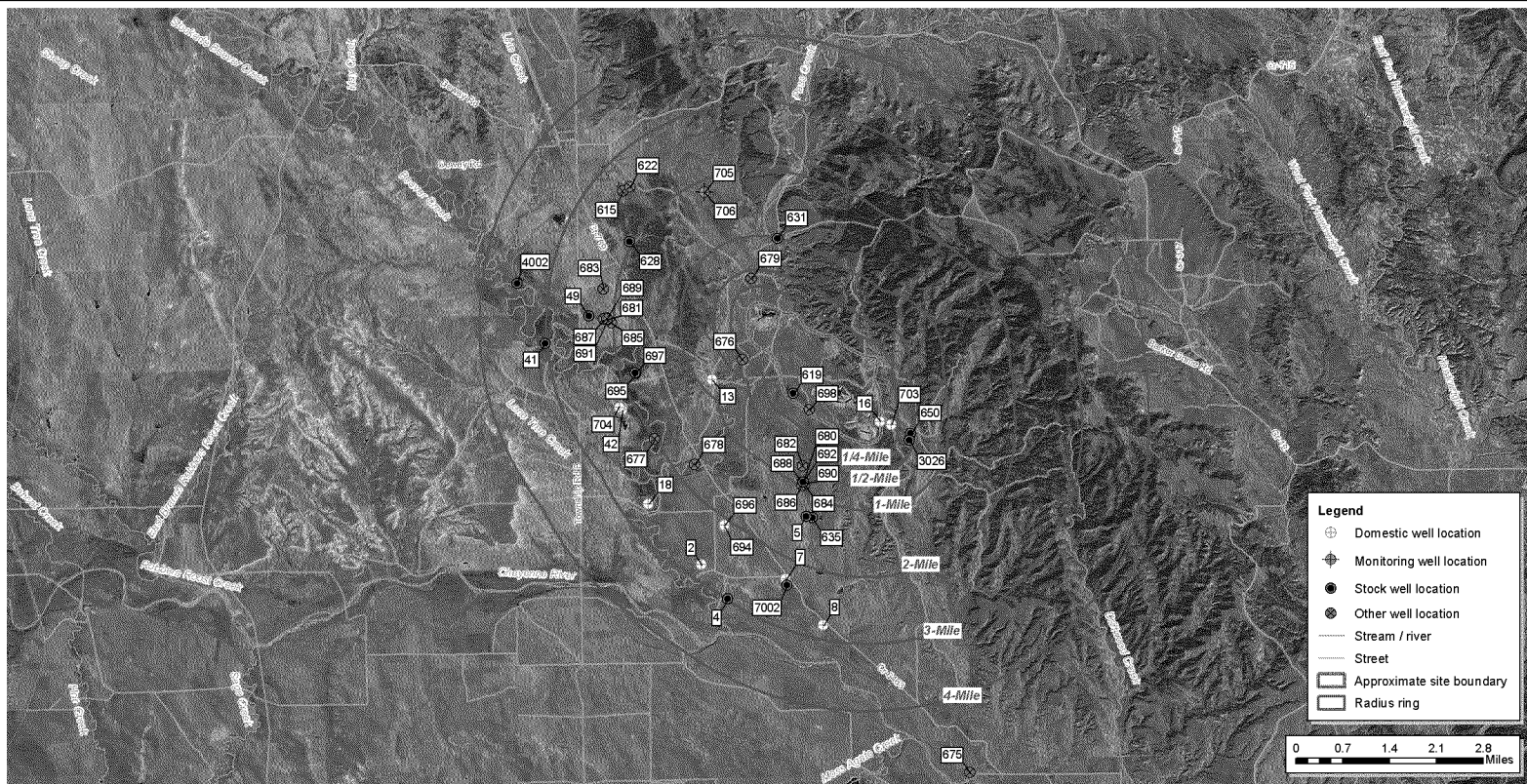


Figure 4
Groundwater Sample Location Map
Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



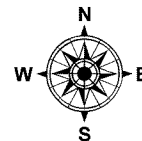
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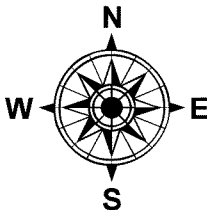
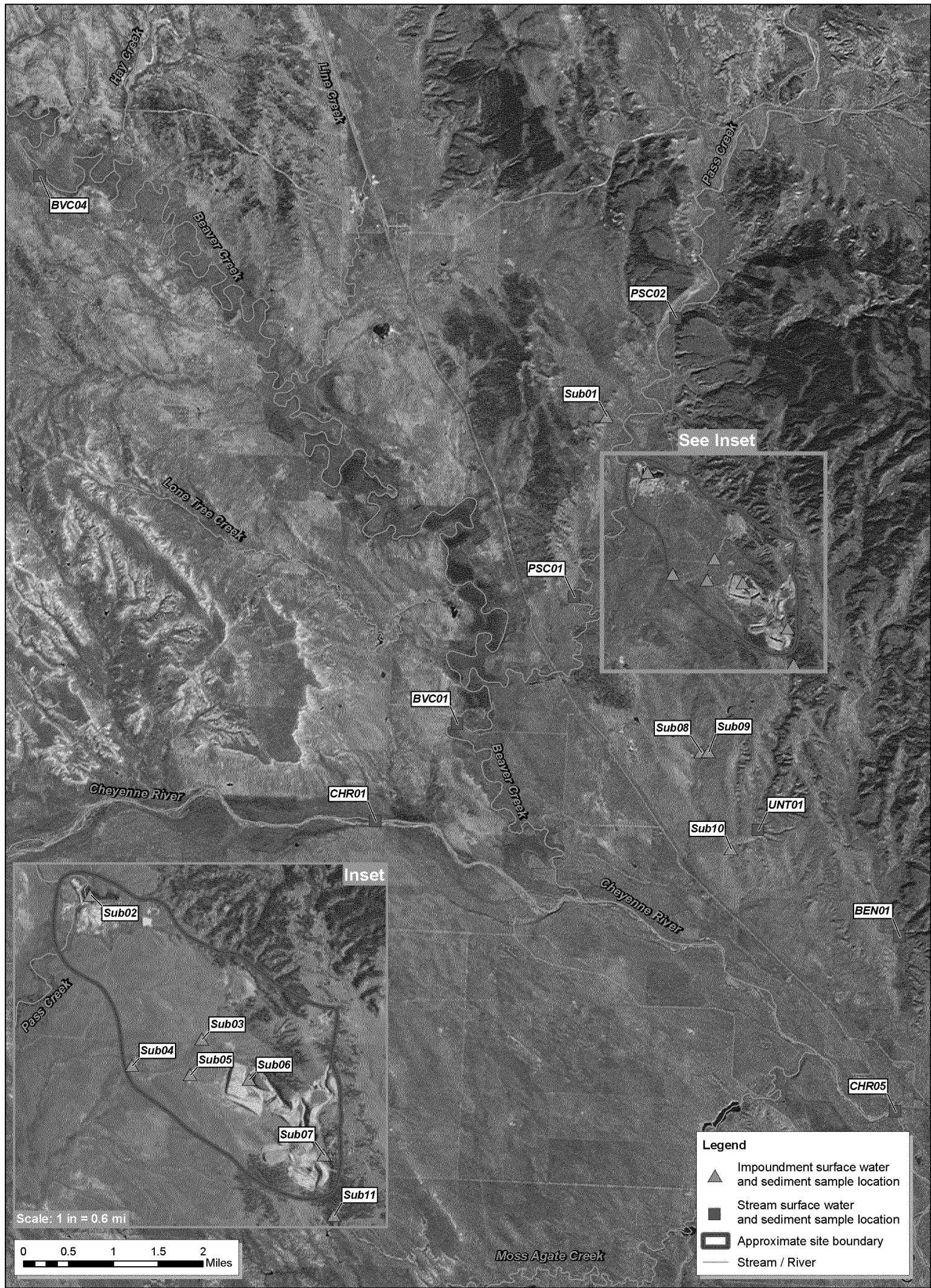


Figure 5
Alluvial Monitoring Well Locations
Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.





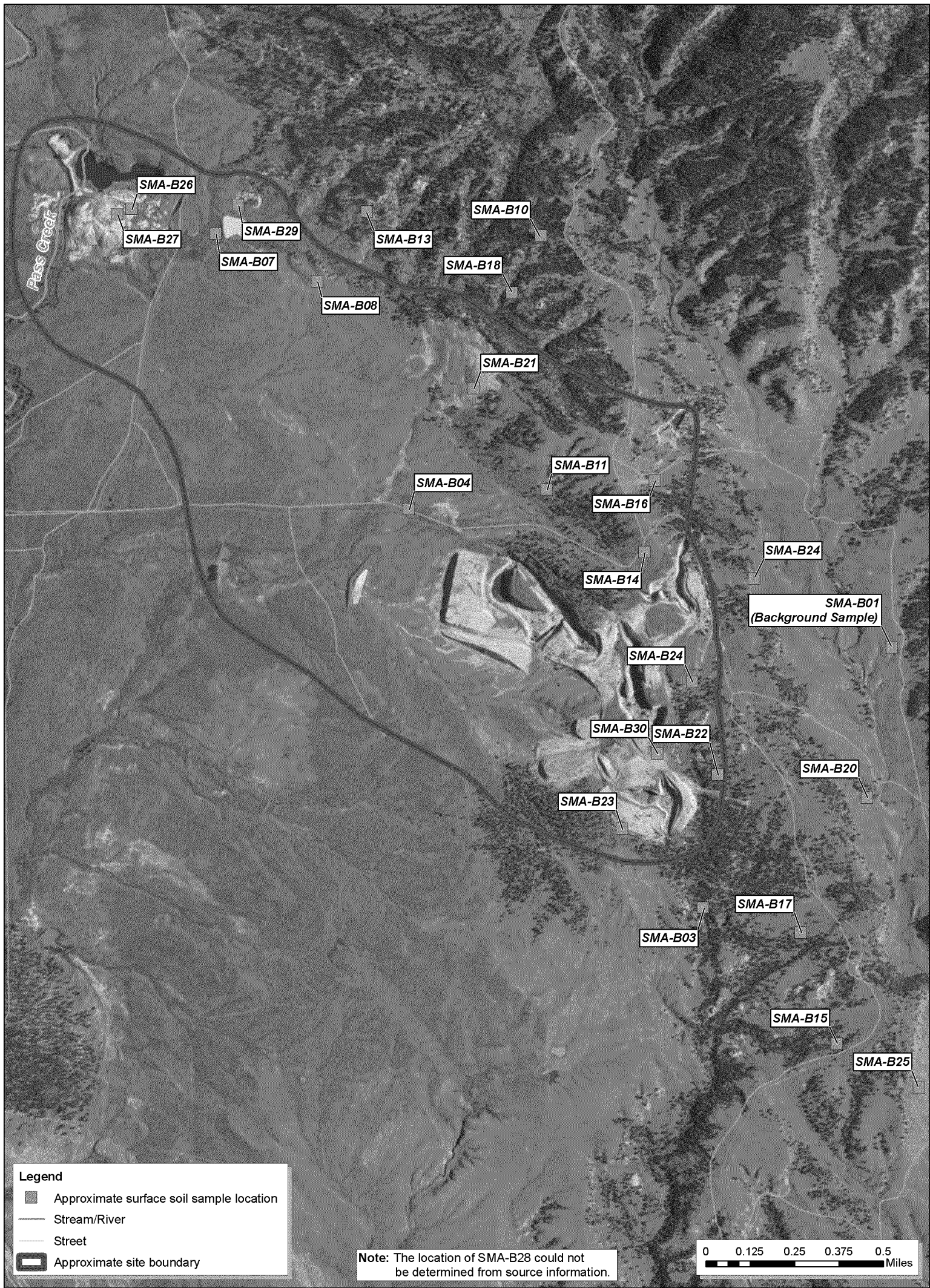
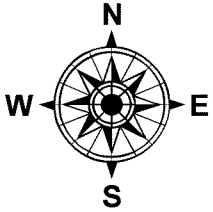


Figure 7
Approximate Surface Soil Sample Locations
Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.



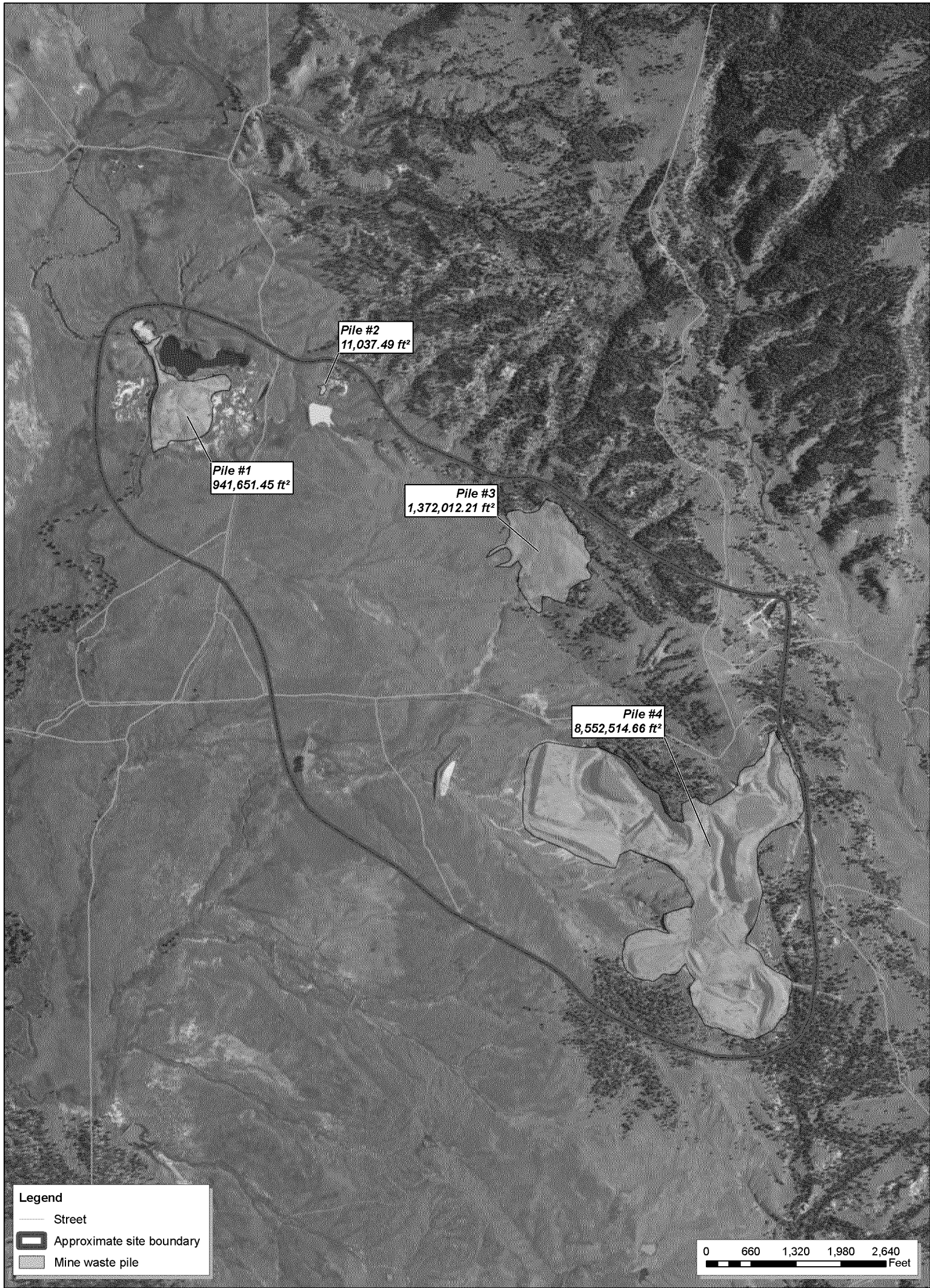
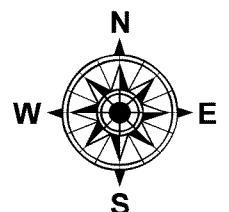


Figure 8
Approximate Source Area Boundaries

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.



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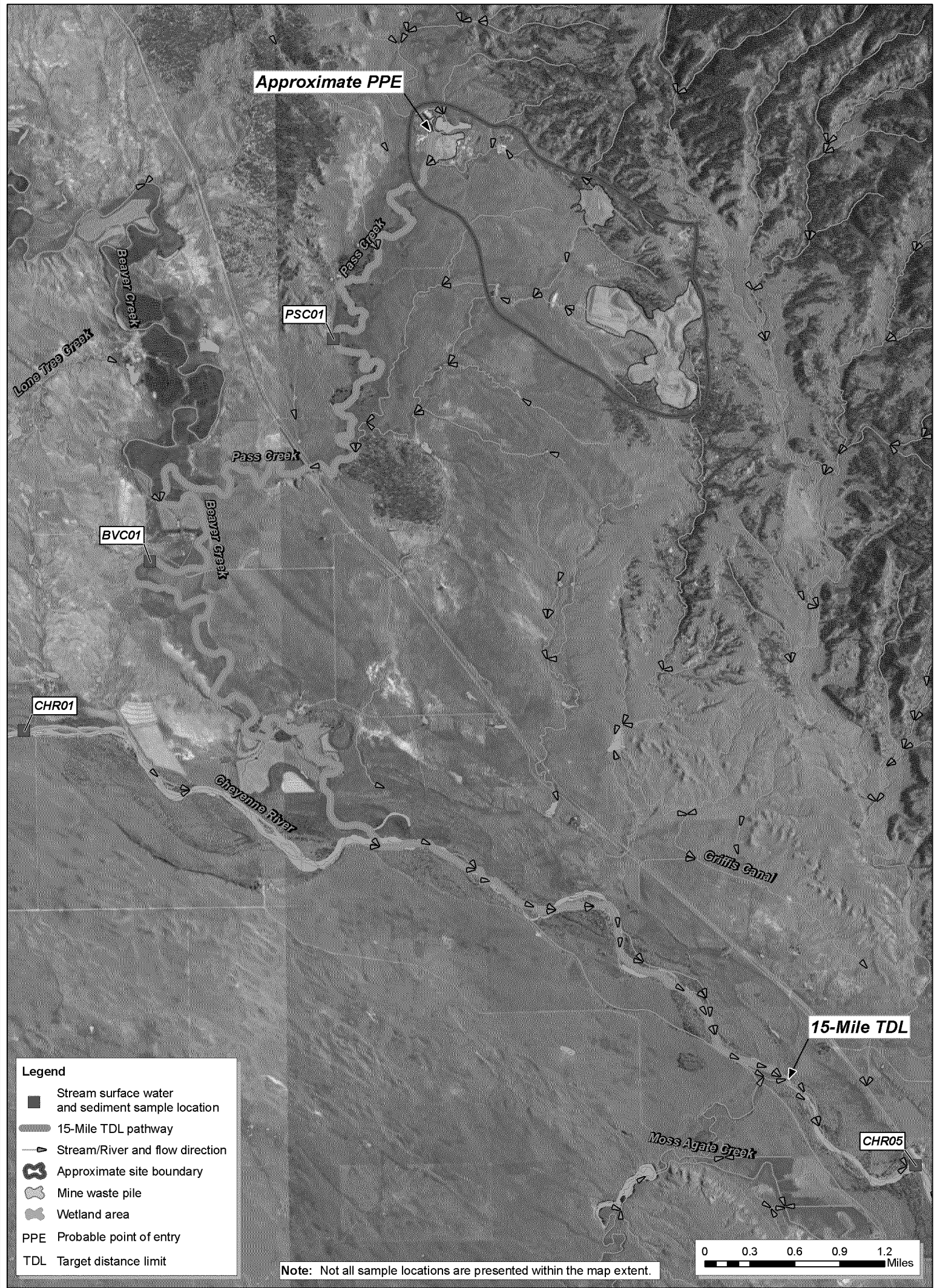
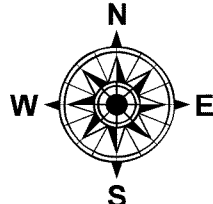


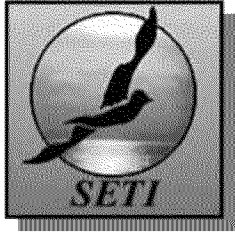
Figure 9
15-Mile Target Distance Limit and Surface Water Sample Locations
Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.



APPENDIX A
SITE RECONNAISSANCE REPORT



Seagull Environmental Technologies, Inc.

3555 Chase Street
Wheat Ridge, Colorado 80212
www.seagullenvirotech.com

May 2, 2014

Victor Ketellapper, Site Assessment Team Leader
U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

**Subject: Site Reconnaissance Report regarding the Darrow/Freezeout/Triangle Uranium Mine Site, near Edgemont, Custer and Fall River Counties, South Dakota
EPA Region 8 START 8(a) Carve-Out Contract EP-S8-11-05, Task Order #0014
Task Monitor: Victor Ketellapper, Site Assessment Team Leader**

Dear Mr. Ketellapper

Seagull Environmental Technologies, Inc. (Seagull) is pleased to submit this Site Reconnaissance Report regarding the Darrow/Freezeout/Triangle Uranium Mine site near Edgemont, Custer and Fall River Counties, South Dakota. If you have any questions or comments, please contact the Project Manager via email at gdillon@seagullenvirotech.com or by phone at (816) 412-1953.

Sincerely,

Gregory R. Dillon
Task Order Project Manager

Hieu Q. Vu, PE
Program Manager

Enclosures

PRELIMINARY ASSESSMENT REPORT

Regarding the

DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE

NEAR EDMONT, SOUTH DAKOTA

EPA ID: SDN000803095

Contract No.: EP-S8-11-05

Task Order No.: 0014

Prepared By:



SEAGULL ENVIRONMENTAL TECHNOLOGIES, INC.
3555 CHASE STREET
WHEAT RIDGE, COLORADO 80202-1129

May 2, 2014

SITE RECONNAISSANCE REPORT
Darrow/Freezeout/Triangle Uranium Mine Site

DATE/TIME: November 5, 2013, 08:00-17:00.

WEATHER CONDITIONS: Cloudy, snow and rain mixture, calm wind ~26° degrees Fahrenheit (°F).

PARTICIPANTS/AFFILIATION: Gregory Dillon and Jon DeBruine of Seagull Environmental Technologies, Inc.

1.0 INTRODUCTION

Under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team (START) Carve-Out 8(a) Contract (No. EP-S8-11-05), Task Order No. 0014, Seagull Environmental Technologies, Inc. (Seagull) has been tasked to conduct a Preliminary Assessment (PA) for the Darrow/Freezeout/Triangle Uranium Mine (Site) site near Edgemont, Custer and Fall River Counties, South Dakota. As part of the PA, Seagull is submitting this Site Visit Report for activities conducted on November 5, 2013, at the Site. The site visit was conducted to locate previously identified source areas and potential sample locations, and to become familiar with the site layout. The Site is located approximately 13 miles northwest of Edgemont, South Dakota.

2.0 SITE DESCRIPTION

The Site encompasses approximately 1,426 acres and is located primarily on private land. Attempts to gain access to the Site area via letters to private landowners were unsuccessful. During the site reconnaissance, START team members Gregory Dillon and Jonathan DeBruine, and Maple Barnard and Valois Shea of EPA traveled along public roads in the site vicinity in an attempt to attain a vantage point of the Site area. However, the public access roads were inadequate to gain a view of the Site.

Photos of the site area, including drainage areas, historical points of interest, and current conditions of the surrounding area were taken during the site reconnaissance. START and EPA visited Edgemont City Hall to meet with local officials to discuss the purpose of the PA and to obtain information for the report. Following the meeting with local officials, Mr. Mike Koopman, City Engineer/Code Administrator, accompanied START and EPA to visit areas of interest in and around Edgemont. The Edgemont, South Dakota, Uranium Mill Tailings Repository and former mill location were visited during the site reconnaissance. In addition, current City of Edgemont Public Water Supply (PWS) wells were visited to document and confirm their locations.

3.0 AREA DESCRIPTION

The Site is located in Custer and Fall River Counties in the Great Plains physiographic province on the edge of the Black Hills uplift. Land use in the area is primarily agricultural range land for livestock. Surface water from the site drains into tributaries of Pass Creek and Beaver Creek, eventually flowing into the Cheyenne River.

4.0 PHOTOGRAPHIC DOCUMENTATION:

Photographs documenting the site visit are included in Appendix A.

APPENDIX A

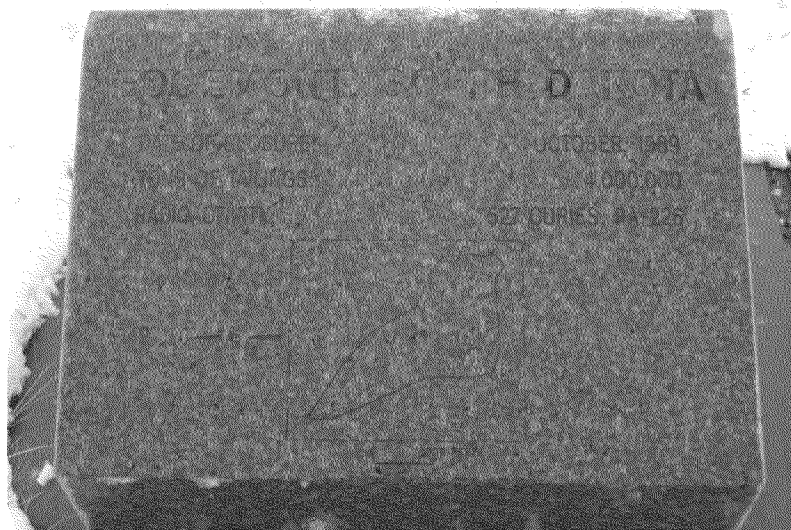
PHOTOGRAPHIC DOCUMENTATION



Darrow/Freezeout/Triangle Uranium Mine Site

Edgemont, South Dakota

Seagull Project No. EPS81105.0014



Client: U.S. Environmental
Protection Agency

Description: Photograph of the geographic marker at the Edgemont,
South Dakota, Uranium Mill Tailings Repository.

Photograph
Number: 1

Direction: N/A

Photographer: Gregory Dillon

Date: 11/5/2013



Client: U.S. Environmental
Protection Agency

Description: Photograph of no trespassing signage at the Edgemont,
South Dakota, Uranium Mill Tailings Repository.

Photograph
Number: 2

Direction: East

Photographer: Gregory Dillon

Date: 11/5/2013



Darrow/Freezeout/Triangle Uranium Mine Site

Edgemont, South Dakota

Seagull Project No. EPS81105.0014



Client: U.S. Environmental
Protection Agency

Description: Photograph of City of Edgemont Municipal Well #2
southwest of town. It is currently an active well for the
City's Public Water Supply (PWS).

Photograph
Number: 3

Direction: North

Photographer: Jon DeBruine

Date: 11/5/2013



Client: U.S. Environmental
Protection Agency

Description: Photograph of City of Edgemont Municipal Well #4
southwest of town. It is currently an active well for the
City's PWS.

Photograph
Number: 4

Direction: East

Photographer: Gregory Dillon

Date: 11/5/2013



Darrow/Freezeout/Triangle Uranium Mine Site

Edgemont, South Dakota

Seagull Project No. EPS81105.0014



Client: U.S. Environmental
Protection Agency

Description: Photograph of an overflow outfall of a City PWS basin and stormwater in the Edgemont City Park. The pond is used for recreational fishing seasonally.

Photograph
Number: 5

Direction: South

Photographer: Jon DeBruine

Date: 11/5/2013



Client: U.S. Environmental
Protection Agency

Description: Photograph of signage at the boundary of the Black Hills National Forest taken from County Road 16.

Photograph
Number: 6

Direction: Northeast

Photographer: Gregory Dillon

Date: 11/5/2013



Darrow/Freezeout/Triangle Uranium Mine Site

Edgemont, South Dakota

Seagull Project No. EPS81105.0014



Client: U.S. Environmental
Protection Agency

Description: Photograph of Pass Creek at crossing of County Highway
6463.

Photograph
Number: 7

Direction: Southwest

Photographer: Gregory Dillon

Date: 11/5/2013



Client: U.S. Environmental
Protection Agency

Description: Photograph of Pass Creek at crossing of County Highway
6463.

Photograph
Number: 8

Direction: Northeast

Photographer: Gregory Dillon

Date: 11/5/2013



Darrow/Freezeout/Triangle Uranium Mine Site

Edgemont, South Dakota

Seagull Project No. EPS81105.0014



Client: U.S. Environmental
Protection Agency

Description: Photograph of the Cheyenne River at the approximate 15-
mile Target Distance Limit (TDL).

Photograph
Number: 9

Direction: West

Photographer: Gregory Dillon

Date: 11/5/2013



Client: U.S. Environmental
Protection Agency

Description: Photograph of the Cheyenne River at the approximate 15-
mile TDL.

Photograph
Number: 10

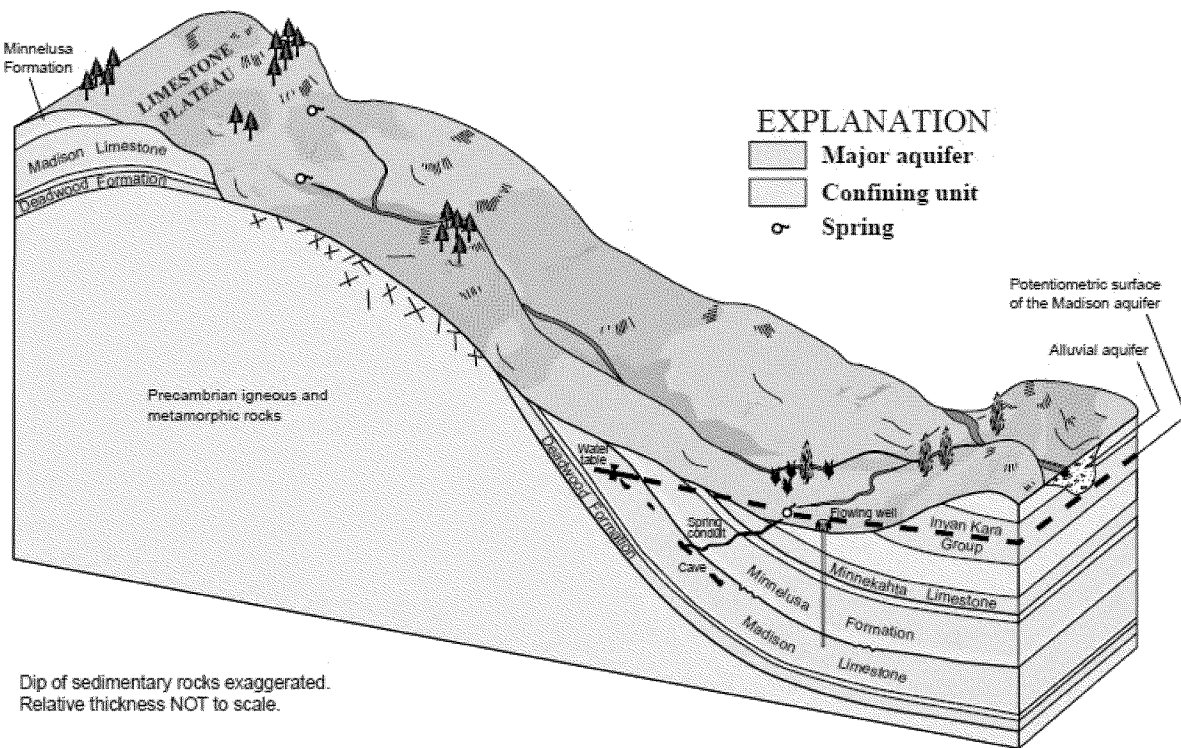
Direction: South

Photographer: Gregory Dillon

Date: 11/5/2013

APPENDIX B

DIAGRAM OF HYDROGEOLOGY OF BLACK HILLS AREA



Simplified Hydrogeologic Setting of the Black Hills Area

Darrow/Freezeout/Triangle Uranium Mine
Edgemont, South Dakota



Seagull Environmental Technologies, Inc.

APPENDIX C
CERCLA ELIGIBILITY CHECKLIST

CERCLA Eligibility Checklist

Site Name: Darrow/Freezeout/Triangle Uranium Mine
 Alias: _____
 City: near Edgemont State South Dakota Zip code 57735
 EPA ID Number (Note - This may be a RCRA or other program ID): SDN000803095

Note: The site is automatically CERCLA eligible if it is a federally owned or operated RCRA site.

| I. CERCLA Authority | Y | N |
|---|----------|----------|
| A. Is the release or threat of release a result of naturally occurring substances in its unaltered form, or altered solely through naturally occurring processes of phenomena, from a location where it is naturally found? | | X |
| B. Is the release or threat of release a result of products that are part of the structure of, and result in exposure within, residential buildings or business or community structures? | | X |
| C. Does the release or threat of release affect public or private drinking water supplies due to deterioration of the system through ordinary use? | | X |
| If YES to A, B, or C, the EPA may not have authority to respond. | | |
| If NO to A, B, or C, the EPA may have authority to respond. | | |

| II. CERCLA Eligibility | Y | N |
|--|----------|----------|
| A. Has this site been previously entered into CERCLIS or is it part of, or adjacent to, an existing CERCLIS site? | X | |
| B. Is this site part of a National Priority List site? | | X |
| C. Did the facility cease operations prior to November 19, 1980? | | X |
| If YES to A, B, or C, then STOP. The facility is probably a CERCLA site. | | |
| If NO, Continue | | |
| 1. RCRA Deferral Factors Did the facility file a RCRA Part A application? | | |
| If YES: | | |
| a. Does the facility currently have interim status? | | |
| b. Did the facility withdraw its Part A application? | | |
| c. Is the facility a known or possible protective filer? (e.g., filed in error, or never operated as TSDFs) | | |
| d. Does the facility have a RCRA Part B Operating Permit or a post closure permit? | | |
| e. Is the facility a late (after 11/19/80) or non-filer that has been identified by the EPA or the state? (i.e., facility did not know it needed to file under RCRA) | | |
| If all answers to questions a, b, and c are NO, STOP. The facility is a CERCLA eligible site. | | |
| If answer to b or c is YES, STOP. The facility is a CERCLA eligible site. | | |
| If answer to b and c are NO and any other answer is YES, site is RCRA, continue to Part 2. | | |

CERCLA Eligibility Checklist

| | | |
|---|--|--|
| <p>2. RCRA Sites Eligible for the NPL</p> <p>Type of facility: Generator _____ Transporter _____ Recycler _____ TSDF (Treatment/Storage/Disposal Facility) <u>X</u></p> | | |
| a. Has the facility owner filed for bankruptcy under federal or state laws? | | |
| b. Has the facility lost RCRA authorization to operate or shown probable unwillingness to carry out corrective actions? | | |
| c. Is the facility a TSDF “converter,” i.e., former TSF that did not pursue a RCRA operating permit and have changed status to “generator” or “non-handler”? | | |
| d. Is the facility a non- or late filer? | | |
| If answer to a, b, c, or d is YES, STOP. The facility is a CERCLA eligible site. | | |
| D. Excluded Releases: | | |
| 1. Does the CERCLA Petroleum Exclusion apply (CERCLA section 101 (13))? | | |
| 2. Does the facility have discharges of CERCLA hazardous substances that are in compliance with federally permitted releases as described in CERCLA section 101 (10)? | | |
| 3. Does the facility have a release or threat of release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against their employer as described in CERCLA section 101 (22)? | | |
| 4. Does the facility have a release or threat of release which results from emissions from engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine as described in CERCLA section 101 (22)? | | |
| 5. Does the facility have a release or threat of release which results from source, byproduct or special nuclear material from a nuclear incident subject to section 170 of the Atomic Energy Act; or from any processing site specifically designated under the Uranium Mill Tailings Radiation Control Act of 1978 as described in CERCLA section 101 (22)? | | |
| 6. Does the facility have a release or threat of release which results from the normal application of fertilizer? | | |
| If answer to 1, 2, 3, 4, 5, or 6 is YES, the facility is NOT CERCLA eligible. | | |
| If NO, the facility may be CERCLA eligible. (If unknown, answer NO). Please list hazardous substances here. | | |
| | | |

CERCLA Eligibility Checklist

| | | |
|---|--|--|
| III. Other programs: The site may never reach the NPL or be a candidate for removal. We need to be able to refer it to any other programs in EPA or state agencies which may have jurisdiction, and thus be able to affect a cleanup. Responses should summarize available information pertaining to the question. Include information in existing files in these programs as part of the PA. Answer all that apply. | | |
| A. Is there an owner or operator? | | |
| B. NPDES-CWA: Is there a discharge water containing pollutants with surface water through a point source (pipe, ditch, channel, conduit, etc.)? | | |
| C. CWA (404): Have fill or dredged material been deposited in a wetland or on the banks of a stream? Is there evidence of heavy equipment operating in ponds, streams or wetlands? | | |
| D. UIC-SDWA: Are fluids being disposed of to the subsurface through a well, cesspool, septic system, pit, etc.? | | |
| E. TSCA: Is it suspected that there are PCB's on the site which came from a source with greater than 50 ppm PCB's such as oil from electrical transformers or capacitors? | | |
| F. FIFRA: Is there a suspected release of pesticides from a pesticide storage site? Are there pesticide containers on site? | | |
| G. RCRA (D): Is there an owner or operator who is obligated to manage solid waste storage or disposal units under state solid waste or groundwater protection regulations? | | |
| H. UST: Is it suspected that there is a leaking underground storage tank containing a product which is a hazardous substance or petroleum? | | |
| I. Brownfields: Is there redevelopment/revitalization interest | | |

Is the site eligible for an assessment under CERCLA authority? Please circle: Yes or No

Site Determination:

Is this site a valid site or incident? Please Circle and explain below

YES or NO

☐ **Enter the site into CERCLIS. Further assessment is recommended (explain below)**

☐ **The site is not recommended for placement into CERCLIS (explain below)**

DECISION/DISCUSSION/RATIONALE:


CERCLA Eligibility Checklist

Regional EPA Reviewer:_____ **Date:**_____

State Agency Reviewer:_____ **Date:**_____

APPENDIX D

POTENTIAL HAZARDOUS WASTE PRELIMINARY ASSESSMENT FORM

| | | | | | |
|--|-----------|--|--|---|-----------------------------|
|  EPA | | Potential Hazardous Waste Site Preliminary Assessment Form | | Identification SDN000803095 | |
| | | | | State SD | Site Number SDN000803095 |
| CERCLIS Discovery Date: March 15, 2013 | | | | | |
| 1. General Site Information | | | | | |
| Name: Darrow/Freezeout/Triangle Uranium Mine | | Street Address: 13 miles NNW of Edgemont | | | |
| City: near Edgemont | State: SD | Zip Code: 57735 | County: Custer and Fall River | Co. Code 21 and 27 | Cong. Dist: 30 |
| Latitude: 43.478486 Longitude: -103.962746 | | Approximate Area of Site: | | Status of Site: | |
| | | <u>1,426</u> Acres ____ Square Miles | | Active Not Specified X Inactive NA | |
| 2. Owner/Operator Information | | | | | |
| Owner: Not Applicable (NA) | | | Operator: | | |
| Street Address: | | | Street Address: | | |
| City: | | | City: | | |
| State: | Zip Code: | Telephone | State: | Zip Code: | Telephone |
| Type of Ownership: Private County Federal Agency Municipal Name _____ Not Specified State Other __ Indian | | | How Initially Identified: Citizen Complaint Federal Program PA Petition Incidental State/Local Program Not Specified RCRA, CERCLA Notification Other _____ | | |
| 3. Site Evaluator Information | | | | | |
| Name of Evaluator: Gregory R. Dillon | | Agency/Organization: Seagull Environmental Technologies, Inc. | | Date Prepared: 04/29/2014 | |
| Street Address: 3555 Chase Street | | City: Wheat Ridge | | State: Colorado | |
| Name of EPA or State Agency Contact: Victor Ketellapper (EPA) | | Street Address: 1595 Wynkoop Street | | | |
| City: Denver | | State: Colorado | | Telephone: 303-312-6578 | |
| 4. Site Disposition (for EPA use only) | | | | | |
| Emergency Response/Removal Assessment Recommendation: Yes No Date _____ | | CERCLIS Recommendation: Higher Priority SI Lower Priority SI NFRAP RCRA Other _____ Date _____ | | Signature: Name (typed): Position: | |



EPA Potential Hazardous Waste Site

Preliminary Assessment Form - Page 2 of 4

CERCLIS Number:

SDN000803095

5. General Site Characteristics

Predominant Land Uses Within One Mile of Site (Check all that apply):

Industrial ☒ Agricultural ☐ DOI
Commercial ☒ Mining ☐ Other Federal Facility
Residential ☐ DOD
X Forest/Fields ☐ DOE Other _____

Site Setting:

Urban
Suburban
X Rural

Years of Operation:

Beginning Year 1952
Ending Year 1994

Unknown

Type of Site Operations (Check all that apply):

Manufacturing (must check subcategory)
Lumber and Wood Products
Inorganic Chemicals
Plastic and/or Rubber Products
Paints, Varnishes
Industrial Organic Chemicals
Agricultural Chemicals
(e.g., pesticides, fertilizers)
X Miscellaneous Chemical Products
(e.g., adhesives, explosives, ink)
Primary Metals
Metal Coating, Plating, Engraving
Metal Forging, Stamping
Fabricated Structural Metal Products
Electronic Equipment
Other Manufacturing
X Mining
X Metals
Coal
Oil and Gas
X Non-metallic Minerals

Retail
Recycling
Junk/Salvage Yard
Municipal Landfill
Other Landfill
DOD
DOE
DOI
Other Federal Facility _____
RCRA
Treatment, Storage, or Disposal
Large Quantity Generator
Small Quantity Generator
Subtitle D
Municipal
Industrial
Converter
Protective Filer
Non- or Late Filer
Not Specified
Other _____

Waste Generated:

On site
Off-site
X On site and off-site

Waste Deposition Authorized By:*

Present Owner
X Former Owner
Present & Former Owner
Unauthorized
Custer County Roads &
Bridges

Waste Accessible to the Public:*

Yes
X No (on site) Unknown if
off-site disposal is
accessible to public.

Distance to Nearest Dwelling,
School, or Workplace:

> 200 Feet

6. Waste Characteristics Information

Source Type:

(Check all that apply)

Source Waste Quantity: Tier*:

(Include units)

Landfill _____
Surface Impoundment _____
Drums _____
Tanks and Non-Drum Containers _____
Chemical Waste Pile _____
Scrap Metal or Junk Pile _____
X Tailings Pile 10,877,215.81 ft² A
Trash Pile (open dump) _____
Land Treatment _____
Contaminated Groundwater Plume
(unidentified source) _____
Contaminated Surface Water/Sediment
(unidentified source) _____
Contaminated Soil _____
Other _____
No Sources

* C = Constituent W = Waste stream V = Volume A = Area

General Types of Waste (Check all that apply)

Metals
Organics
X Inorganics
Solvents
Paints/Pigments
Laboratory/Hospital Waste
X Radioactive Waste
Construction/Demolition
Waste

Pesticides/Herbicides
Acids/Bases
Oily Waste
Municipal Waste
Mining Waste
Explosives
Other _____

Physical State of Waste as Deposited (Check all that apply):*

X Solid
Liquid
Sludge
Gas
Powder

**EPA****Potential Hazardous Waste Site****Preliminary Assessment Form - Page 3 of 4****CERCLIS Number:****SDN000803095****7. Groundwater Pathway**

| | | |
|---|--|---|
| <p>Is Groundwater Used for Drinking Water Within 4 Miles?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Type of Drinking Water Wells Within 4 Miles (Check all that apply):</p> <p><input type="checkbox"/> Municipal <input checked="" type="checkbox"/> Private <input type="checkbox"/> None</p> | <p>Is There a Suspected Release to Groundwater?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Have Primary Target Drinking Water Wells Been Identified?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If yes, Enter Primary Target Population: Approximately 4.24 individuals based on County average populations per household.</p> | <p>List Secondary Target Population Served by Groundwater Withdrawn From:</p> <p>0 - ¼ Mile * <u>2.12</u></p> <p>> ¼ - ½ Mile * <u>2.17</u></p> <p>> ½ - 1 Mile * <u>2.12</u></p> <p>> 1 - 2 Miles * <u>0</u></p> <p>> 2 - 3 Miles * <u>14.84</u></p> <p>> 3 - 4 Miles * <u>13.02</u></p> <p>Total Within 4 Miles <u>34.27</u></p> |
| <p>Depth to Shallowest Aquifer:</p> <p><u>0 to 50 feet below ground surface</u></p> <p>Karst Terrain/Aquifer Present:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> | <p>Nearest Designated Wellhead Protection Area:</p> <p><input type="checkbox"/> Underlies Site <input type="checkbox"/> > 0 - 4 Miles <input checked="" type="checkbox"/> None Within 4 Miles</p> | |

8. Surface Water Pathway

| <p>Type of Surface Water Draining Site and 15 Miles Downstream (Check all that apply):</p> <p><input checked="" type="checkbox"/> Stream <input checked="" type="checkbox"/> River <input type="checkbox"/> Pond <input type="checkbox"/> Lake <input type="checkbox"/> Bay <input type="checkbox"/> Ocean <input type="checkbox"/> Other _____</p> | <p>Shortest Overland Distance From Any Source To Surface Water:*</p> <p>_____ < 100 _____ Feet _____ _____ Miles</p> | | | | | | | | | | | | | | | | |
|---|--|-------------------------|-------------------|---------------------|-------------------|-----------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <p>Is There a Suspected Release to Surface Water?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p> | <p>Site is Located in:</p> <p><input type="checkbox"/> Annual - 10-year Floodplain <input checked="" type="checkbox"/> > 10-year - 100-year Floodplain <input type="checkbox"/> > 100-year - 500-year Floodplain <input type="checkbox"/> > 500-year Floodplain</p> | | | | | | | | | | | | | | | | |
| <p>Drinking Water Intakes Located Along the Surface Water Migration Path:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Have Primary Target Drinking Water Intakes Been Identified:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If Yes, Enter Population Served by Primary Target Intakes:</p> <p><u>0</u> People</p> | <p>List All Secondary Target Drinking Water Intakes:</p> <table border="1"><thead><tr><th>Name</th><th>Water Body</th><th>Flow (cfs)</th><th>Population Served</th></tr></thead><tbody><tr><td>_____</td><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td><td>_____</td></tr><tr><td>_____</td><td>_____</td><td>_____</td><td>_____</td></tr></tbody></table> | Name | Water Body | Flow (cfs) | Population Served | _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Name | Water Body | Flow (cfs) | Population Served | | | | | | | | | | | | | | |
| _____ | _____ | _____ | _____ | | | | | | | | | | | | | | |
| _____ | _____ | _____ | _____ | | | | | | | | | | | | | | |
| _____ | _____ | _____ | _____ | | | | | | | | | | | | | | |
| <p>Fisheries Located Along the Surface Water Migration Path:</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Have Primary Target Fisheries Been Identified:</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> | <p>List All Secondary Target Fisheries:</p> <table border="1"><thead><tr><th>Water Body/Fishery Name</th><th>Flow (cfs)</th></tr></thead><tbody><tr><td><u>Beaver Creek</u></td><td><u>9.9</u></td></tr><tr><td><u>Cheyenne River</u></td><td><u>23.0</u></td></tr></tbody></table> | Water Body/Fishery Name | Flow (cfs) | <u>Beaver Creek</u> | <u>9.9</u> | <u>Cheyenne River</u> | <u>23.0</u> | | | | | | | | | | |
| Water Body/Fishery Name | Flow (cfs) | | | | | | | | | | | | | | | | |
| <u>Beaver Creek</u> | <u>9.9</u> | | | | | | | | | | | | | | | | |
| <u>Cheyenne River</u> | <u>23.0</u> | | | | | | | | | | | | | | | | |



EPA Potential Hazardous Waste Site

Preliminary Assessment Form - Page 4 of 4

CERCLIS Number:

SDN000803095

8. Surface Water Pathway (continued)

Wetlands Located Along the Surface Water Migration Path:

X Yes
No
Unknown

Have Primary Target Wetlands Been Identified:

Yes
X No

List Secondary Target Wetlands:

| Water Body | Flow (cfs) | Frontage Miles |
|------------------------|------------|----------------|
| Chevenne River (PEMA) | 23.0 | 0.23 |
| Chevenne River (R2USA) | 23.0 | 0.74 |
| Chevenne River (R2USA) | 23.0 | 0.27 |
| _____ | _____ | _____ |

Other Sensitive Environments Located Along the Surface Water Migration Path:

Yes
X No

Have Primary Target Sensitive Environments Been Identified:

Yes
X No

List Secondary Target Sensitive Environments:

| Water Body | Flow (cfs) | Sensitive Environment Type |
|------------|------------|----------------------------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare On or Within 200 Feet of Areas of Known or Suspected Contamination*?

Yes
X No

If Yes, Enter Total Resident Population:

_____ People (part-time

Number of Workers On Site*:

X None
1 - 100
101 - 1,000
>1,000

Have Terrestrial Sensitive Environments Been Identified On or Within 200 Feet of Areas of Known or Suspected Contamination*?

Yes
X No

If Yes, List Each Terrestrial Sensitive Environment:

10. Air Pathway

Is There a Suspected Release to Air:

Yes
X No

Enter Total Population On or Within:

On Site _____
0 - 1/4 Mile _____
>1/4 - 1/2 Mile _____
>1/2 Mile - 1 Mile _____
>1 - 2 Miles _____
>2 - 3 Miles _____
>3 - 4 Miles _____
Total Within 4 Miles _____

Wetlands Located Within 4 Miles of the Site:

X Yes
No
Unknown

Other Sensitive Environments Located Within 4 Miles of the Site:*

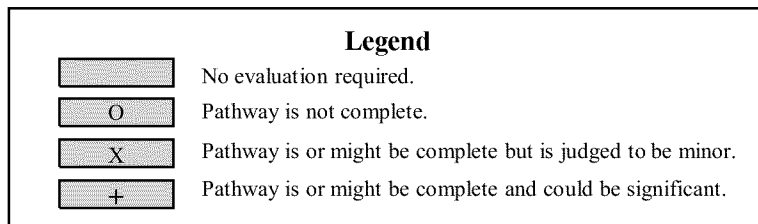
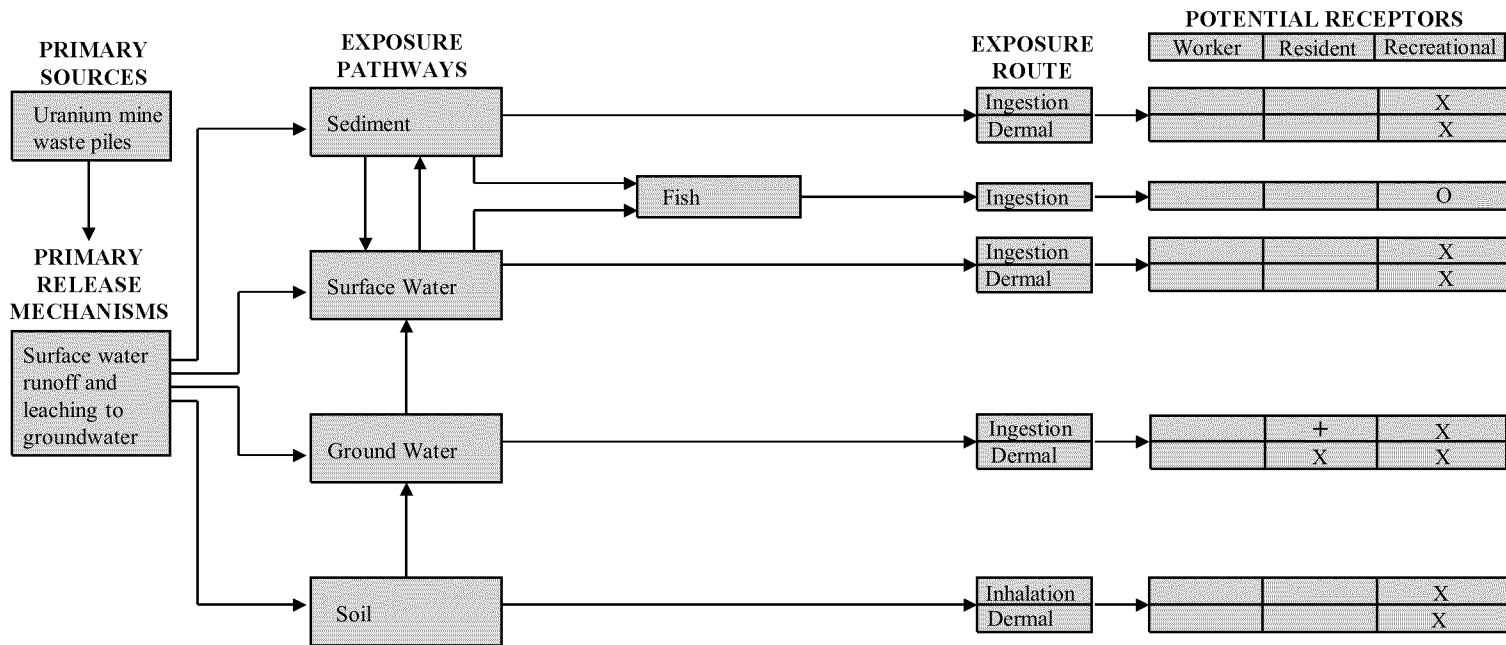
Yes
No
X Unknown

List All Sensitive Environments Within 1/2 Mile of the Site:

| Distance | Sensitive Environment Type/Wetlands Area (acres) |
|------------------|--|
| On Site | _____ |
| 0 - 1/4 Mile | _____ |
| > 1/4 - 1/2 Mile | _____ |

APPENDIX E
CONCEPTUAL SITE MODEL

SITE CONCEPTUAL MODEL DARROW/FREEZEOUT/TRIANGLE URANIUM MINE SITE EDGEMONT, SOUTH DAKOTA



ATTACHMENT 10



ANALYTICAL SUMMARY REPORT

January 12, 2015

Oglala Sioux Tribe Natural Resource Reg Agency
W Hwy 18
Pine Ridge, SD 57770

Work Order: R14120184 Quote ID: R462
Project Name: Radiological

Energy Laboratories Inc. Rapid City SD received the following 1 sample for Oglala Sioux Tribe Natural Resource Reg Agency on 12/11/2014 for analysis.

| Lab ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|--------------------------|----------------|--------------|---------|---|
| R14120184-001 | Cheyenne River/Red Shirt | 12/11/14 10:35 | 12/11/14 | Aqueous | Total Uranium Metals Digestion by EPA 200.2 Gross Alpha, Gross Beta |

This report was prepared by Energy Laboratories, Inc., 2821 Plant St., Rapid City, SD 57702. As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By:


Branch Manager

Digitally signed by
Linda Larson
Date: 2015.01.15 16:15:56 -07:00



CLIENT: Oglala Sioux Tribe Natural Resource Reg A
Project: Radiological
Work Order: R14120184

Report Date: 01/12/15

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002 and WY00937.

LABORATORY ANALYTICAL REPORT

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agency

Project: Radiological

Lab ID: R14120184-001

Client Sample ID: Cheyenne River/Red Shirt

Report Date: 01/12/15

Collection Date: 12/11/14 10:35

Date Received: 12/11/14

Matrix: AQUEOUS

| Analyses | Result | Units | Qual | RL | MCL/ QCL | DF | Method | Analysis Date / By |
|------------------------------------|--------|-------|------|-----|-------------|----|--------|-----------------------|
| METALS | | | | | | | | |
| Uranium | 17 | ug/L | | 1 | 30 | 1 | E200.8 | 12/24/14 17:02/eli-ca |
| Uranium, Activity | 11.7 | pCi/L | | 0.7 | 20 | 1 | E200.8 | 12/24/14 17:02/eli-ca |
| RADIONUCLIDES - TOTAL | | | | | | | | |
| Gross Alpha | 26.7 | pCi/L | * | | 15 | 1 | E900.0 | 12/24/14 12:34/eli-ca |
| Gross Alpha precision (±) | 6.7 | pCi/L | | | | 1 | E900.0 | 12/24/14 12:34/eli-ca |
| Gross Alpha MDC | 5.1 | pCi/L | | | | 1 | E900.0 | 12/24/14 12:34/eli-ca |
| Adjusted gross alpha is 15.0 pCi/L | | | | | | | | |

Report Definitions:
 RL - Analyte reporting limit.
 QCL - Quality control limit.
 MDC - Minimum detectable concentration

MCL - Maximum contaminant level.
 ND - Not detected at the reporting limit.
 * - The result exceeds the MCL.

QA/QC Summary Report

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agenc

Report Date: 01/12/15

Project: Radiological

Work Order: R14120184

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|---|-------|---------|------|-----------|------------|------------------|----------|----------------|
| Method: E200.8 | Analytical Run: SUB-C194664 | | | | | | | | |
| Lab ID: ICV | Initial Calibration Verification Standard | | | | | | | | 12/24/14 14:51 |
| Uranium | 0.0475 | mg/L | 0.00030 | 95 | 90 | 110 | | | |
| Method: E200.8 | Batch: C_43486 | | | | | | | | |
| Lab ID: MB-43486 | Method Blank | | | | | | | | 12/24/14 15:50 |
| Uranium | 4E-05 | mg/L | 1E-05 | | | | Run: SUB-C194664 | | |
| Lab ID: LCS3-43486 | Laboratory Control Sample | | | | | | | | 12/24/14 15:54 |
| Uranium | 0.50 | mg/L | 0.00030 | 99 | 85 | 115 | Run: SUB-C194664 | | |
| Lab ID: C14120456-001BMS3 | Sample Matrix Spike | | | | | | | | 12/24/14 16:18 |
| Uranium | 0.54 | mg/L | 0.00030 | 108 | 70 | 130 | Run: SUB-C194664 | | |
| Lab ID: C14120456-001BMDS3 | Sample Matrix Spike Duplicate | | | | | | | | 12/24/14 16:20 |
| Uranium | 0.55 | mg/L | 0.00030 | 110 | 70 | 130 | 2.2 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Rapid City, SD Branch

Client: Oglala Sioux Tribe Natural Resource Reg Agenc

Report Date: 01/12/15

Project: Radiological

Work Order: R14120184

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|----------------------------------|-------------------------------|-------|----|------|------------------|------------|--------------------|----------|------|
| Method: E900.0 | | | | | | | Batch: C_GrDW-0658 | | |
| Lab ID: Th230-GrDW-0658 | Laboratory Control Sample | | | | Run: SUB-C194686 | | 12/24/14 12:34 | | |
| Gross Alpha | 140 | pCi/L | | 120 | 80 | 120 | | | |
| Lab ID: MB-GrDW-0658 | Method Blank | | | | Run: SUB-C194686 | | 12/24/14 12:34 | | |
| Gross Alpha | 2 | pCi/L | | | | | | | |
| Gross Alpha precision (±) | 0.9 | pCi/L | | | | | | | |
| Gross Alpha MDC | 0.8 | pCi/L | | | | | | | |
| Lab ID: C14120574-001BMS | Sample Matrix Spike | | | | Run: SUB-C194686 | | 12/24/14 12:34 | | |
| Gross Alpha | 100 | pCi/L | | 80 | 70 | 130 | | | |
| Lab ID: C14120574-001BMDS | Sample Matrix Spike Duplicate | | | | Run: SUB-C194686 | | 12/24/14 12:34 | | |
| Gross Alpha | 95 | pCi/L | | 74 | 70 | 130 | 7.1 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

Workorder Receipt Checklist

Oglala Sioux Tribe Natural Resource Reg
Agency

R14120184

Login completed by: Steve Froiland

Date Received: 12/11/2014

Reviewed by: Linda Larson

Received by: sf

Reviewed Date: 1/8/2015

Carrier Hand Delivered
name:

| | | | |
|---|--------------------------------------|-------------------------------------|---|
| Shipping container/cooler in good condition? | Yes <input checked="" type="radio"/> | No <input type="radio"/> | Not Present <input type="radio"/> |
| Custody seals intact on all shipping container(s)/cooler(s)? | Yes <input checked="" type="radio"/> | No <input type="radio"/> | Not Present <input type="radio"/> |
| Custody seals intact on all sample bottles? | Yes <input checked="" type="radio"/> | No <input type="radio"/> | Not Present <input type="radio"/> |
| Chain of custody present? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Chain of custody signed when relinquished and received? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Chain of custody agrees with sample labels? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Samples in proper container/bottle? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Sample containers intact? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Sufficient sample volume for indicated test? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.) | Yes <input type="radio"/> | No <input checked="" type="radio"/> | |
| Temp Blank received in all shipping container(s)/cooler(s)? | Yes <input checked="" type="radio"/> | No <input type="radio"/> | Not Applicable <input checked="" type="radio"/> |
| Container/Temp Blank temperature: | 21.4°C From Field | | |
| Water - VOA vials have zero headspace? | Yes <input checked="" type="radio"/> | No <input type="radio"/> | No VOA vials submitted <input type="radio"/> |
| Water - pH acceptable upon receipt? | Yes <input type="radio"/> | No <input checked="" type="radio"/> | Not Applicable <input checked="" type="radio"/> |

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Contact and Corrective Action Comments:

None

ED 005364K 00014154-00133

ATTACHMENT 11

**PROGRAMMATIC AGREEMENT
AMONG
U.S. NUCLEAR REGULATORY COMMISSION
U.S. BUREAU OF LAND MANAGEMENT
SOUTH DAKOTA STATE HISTORIC PRESERVATION OFFICE
POWERTECH (USA), INC.
AND
ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING THE
DEWEY-BURDOCK IN SITU RECOVERY PROJECT
LOCATED IN CUSTER AND FALL RIVER COUNTIES
SOUTH DAKOTA**

Date 03-19-14

WHEREAS, the U.S. Nuclear Regulatory Commission (NRC) received an application from Powertech (USA), Inc. (Powertech or applicant) for a new radioactive source materials license to develop and operate the Dewey-Burdock Project (the undertaking) located near Edgemont, South Dakota in Fall River and Custer counties (Project) pursuant to the NRC licensing authority under the Atomic Energy Act of 1954 (AEA), 42 U.S.C. §§ 2011 *et seq.*; and

WHEREAS, NRC is considering issuance of a license for the Dewey-Burdock In Situ Recovery [ISR] Project pursuant to its authority under the Atomic Energy Act of 1954 (AEA), 42 U.S.C. §§ 2011 *et seq.* which makes the project an undertaking requiring compliance by NRC with Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470, and its implementing regulations (36 CFR § 800 (2004)); and

WHEREAS, if licensed, the proposed project will use an In Situ Recovery (ISR) methodology to extract uranium and process it into yellowcake at the Dewey-Burdock site; and

WHEREAS, the proposed project area consists of approximately 10,580 acres (4,282 ha) located on both sides of Dewey Road (County Road 6463) and includes portions of Sections 1-5, 10-12, 14, and 15, in Township 7 South, Range 1 East and portions of Sections 20, 21, 27, 28, 29, and 30-35 in Township 6 South, Range 1 East, Black Hill Meridian, (see Appendix A and Figure 1.0 for fuller description and a map of the project area); and

WHEREAS, under the terms of the General Mining Act of 1872 Powertech has filed Federal Lode mining claims and secured mineral rights on 240 acres [97 ha] of public lands open to mineral entry and administered by the U.S. Department of the Interior, Bureau of Land Management (BLM), and has the right to develop the mining claims as long as this can be accomplished without causing unnecessary or undue degradation to public lands and in accordance with pertinent laws and regulations under 43 CFR Subpart 3809; and

WHEREAS, review and approval of a Plan of Operations for the project that meets the requirements of 43 CFR Subpart 3809 by the BLM-South Dakota Field Office makes the project an undertaking requiring compliance by BLM with Section 106 of the NHPA, 16 U.S.C. § 470 and 36 CFR Part 800; and

WHEREAS, the BLM, by letter dated April 7, 2011, has designated the NRC as the lead agency for compliance with requirements of Section 106 of the NHPA regarding the Dewey-Burdock Project

(ADAMS Accession No. ML11116A091) pursuant to 36 CFR § 800.2(a)(2) of the Section 106 regulations; and

WHEREAS, under the terms of the Safe Drinking Water Act, Powertech has submitted to the Environmental Protection Agency (EPA) two Underground Injection Control (UIC) Permit Applications for ISR uranium recovery and the disposal of treated ISR process fluids at the Dewey-Burdock site; the EPA will issue draft permit decisions that meet the requirements of UIC regulations found at 40 CFR Parts 124, 144, 146 and 147; and

WHEREAS, the NRC determined a phased process for compliance with Section 106 of the NHPA is appropriate for this undertaking, as specifically permitted under 36 CFR § 800.4(b)(2), such that completion of the evaluation of and determinations of effects on historic properties, and consultation concerning measures to avoid, minimize, or mitigate any adverse effects will be carried out in phases, as set forth in this Programmatic Agreement (PA) (see Appendix A for details); and

WHEREAS, the area of potential effects (APE) for the undertaking is the area at the Dewey-Burdock Project site and its immediate environs, which may be directly or indirectly impacted by construction and operation activities associated with the proposed project, as described in Appendix A; and

WHEREAS, Project activities may occur on lands outside the license boundary for the installation of electrical transmission lines, and will be addressed in accordance with Stipulations 3 and 4 of this PA; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(1)(i)(C), the NRC, by letter dated April 24, 2013, notified the Advisory Council on Historic Preservation (ACHP) of the potential for adverse effects to historic properties from the undertaking and invited the ACHP to participate in Section 106 consultation and in the preparation of this PA; and

WHEREAS, the ACHP, by letter, dated October 28, 2013, formally entered the consultation; and

WHEREAS, the NRC initiated consultation with the South Dakota State Historic Preservation Officer (SD SHPO) on December 2, 2009, during a face-to-face meeting held in Pierre, South Dakota; and

WHEREAS, the NRC invited Powertech to participate in Section 106 consultation and preparation of this PA; and

WHEREAS, by letters dated March 19, 2010 (ML100331999) and September 8, 2010 (ML102450647), the NRC invited 23 federally-recognized Indian Tribes who may ascribe religious and cultural significance to historic properties that may be affected by the undertaking, including the Cheyenne and Arapaho Tribes of Oklahoma, the Cheyenne River Sioux Tribe, the Crow Nation, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe, the Flandreau Santee Sioux Tribe, the Fort Peck Assiniboine and Sioux Tribes, the Lower Brule Sioux Tribe, the Lower Sioux Indian Community, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Omaha Tribe of Nebraska, the Pawnee Nation of Oklahoma, the Ponca Tribe of Nebraska, the Rosebud Sioux Tribe, the Santee Sioux Tribe of Nebraska, the Sisseton-Wahpeton Oyate, the Spirit Lake Sioux Tribe, the Standing Rock Sioux Tribe, the Three Affiliated Tribes (Mandan, Hidatsa & Arikara Nations), the Turtle Mountain Band of Chippewa Indians, and the Yankton Sioux Tribe (collectively referred to as Tribes), to each be a consulting party in the Section 106 process; and

WHEREAS, the following 23 Tribes participated in consultation at varying levels with the NRC and BLM regarding the proposed Dewey-Burdock Project: the Cheyenne and Arapaho Tribes of Oklahoma,

the Cheyenne River Sioux Tribe, the Crow Nation, the Crow Creek Sioux Tribe, the Eastern Shoshone Tribe, the Flandreau Santee Sioux Tribe, the Fort Peck Assiniboiné and Sioux Tribes, the Lower Brulé Sioux Tribe, the Lower Sioux Indian Community, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Oglala Sioux Tribe, the Omaha Tribe of Nebraska, the Pawnee Nation of Oklahoma, the Ponca Tribe of Nebraska, the Rosebud Sioux Tribe, the Santee Sioux Tribe of Nebraska, the Sisseton-Wahpeton Oyate, the Spirit Lake Sioux Tribe, the Standing Rock Sioux Tribe, the Three Affiliated Tribes (Mandan, Hidatsa & Arikara Nations), the Turtle Mountain Band of Chippewa Indians, and the Yankton Sioux Tribe; and

WHEREAS, the NRC worked with consulting Tribes between November 2011 and October 2012 to develop an approach for identifying historic properties of cultural and religious significance to Tribes; the NRC conducted a face-to-face consultation focused on the identification of these properties in February 2012. Although several work plans for a tribal field survey were prepared and discussed by the consulting parties throughout 2012, the parties were unable to reach agreement on the scope and the cost of the Tribal survey (see Appendix B for details); and

WHEREAS, in October 2012, the NRC requested alternative approaches to conduct a tribal field survey and subsequently proposed opening the project area to all interested Tribes to complete the survey according to their needs and interests, with payments to be made to participating Tribes (see Appendix B for details); and

WHEREAS, the NRC offered all 23 consulting Tribes the opportunity to participate in a tribal field survey to identify properties of religious and cultural significance to them for the proposed Dewey-Burdock project ISR facility by letter dated February 8, 2013; and

WHEREAS, the following seven Tribes participated in the tribal field survey: the Northern Arapaho Tribe, the Northern Cheyenne Tribe, the Cheyenne and Arapaho Tribes of Oklahoma, the Crow Nation, the Santee Sioux Tribe, the Crow Creek Sioux Tribe, and the Turtle Mountain Band of Chippewa Indians as discussed in details in Appendix A; and

WHEREAS, surveys to identify historic properties have been completed for the project including Class III archaeological surveys and tribal surveys to identify properties of religious and cultural significance; and

WHEREAS, the NRC received tribal survey reports with eligibility recommendations from the Northern Arapaho Tribe, the Northern Cheyenne Tribe, and the Cheyenne and Arapaho Tribes of Oklahoma, as well as field notes from the Crow Nation as discussed in Appendix A; and

WHEREAS, the NRC staff has reviewed and evaluated the results of the applicant's Class III archaeological surveys and tribal surveys in the development of its initial recommendations concerning eligibility of properties identified within the APE for the undertaking for inclusion on the National Register of Historic Places (NRHP) as presented in Appendix B; and

WHEREAS, the NRC has received concurrence from the SD SHPO on these eligibility determinations as discussed in Appendix B, eligibility determinations were also sent to the Tribes with a 30-day review and comment period; and

WHEREAS, the NRC invited each of the 23 consulting Tribes to participate in the development of this PA; and

WHEREAS, the following Tribes participated at varying levels in webinars and/or provided written comments during the preparation of this PA: Northern Cheyenne, Cheyenne River Sioux, Oglala Sioux, Standing Rock Sioux, Fort Peck Assiniboine and Sioux, and Cheyenne and Arapaho Tribes; (see Appendix B for list of participants); and

WHEREAS, each of the 23 consulting tribes will be invited to sign the PA as a Concurring Party; and

WHEREAS, the BLM, as a federal agency with a federal action related to this undertaking has participated in the Section 106 consultation and development of this agreement and will be a signatory; and

WHEREAS, the EPA has participated in discussions of this agreement; and

WHEREAS, the PA will be entered as a condition on the NRC license, if granted; and

WHEREAS, the PA will be entered as a condition of Powertech Inc.'s Plan of Operation, if approved by the BLM; and

WHEREAS, Powertech, as the applicant for federal approvals has been invited to execute this agreement as an invited signatory in recognition of the responsibilities assigned to the applicant under the terms of this agreement;

NOW, THEREFORE, the NRC, BLM, SD SHPO, Powertech, and the ACHP agree that the undertaking will be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties.

STIPULATIONS:

NRC (or BLM on BLM-administered land) shall ensure that the following measures are carried out within its regulatory authority:

1) Conditions for Federal Approval:

- a) The NRC will require that Powertech comply with all applicable stipulations and provisions of this PA, as a condition of the Powertech license for the Project.
- b) The BLM will ensure that a Record of Decision on an acceptable Plan of Operation will not be signed until all required signatories have executed this PA.
- c) The NRC shall not grant a license to Powertech until all required signatories have executed this PA. Upon receipt of a fully executed PA, the NRC will issue the license when all other requirements for the license have been met.
- d) If a license amendment is required due to a change in the design or operation of the Project, and if that change would involve ground disturbing activities outside the currently identified disturbance areas, NRC will reconsider the eligibility determinations (in accordance with Stipulation 3) of any archaeological sites with tribally defined features and any tribally identified sites previously found not eligible that may be affected by the new ground disturbance.

2) Identification and Evaluation of Historic Properties within the License Boundary:

- a) Appendix B provides information on the archaeological and tribal filed surveys and describes the cultural resources identified within and adjacent to the boundary of the 10,580-acre project site. More than 300 cultural resources were identified.
- b) In consultation with SD SHPO and the Tribes, the NRC and BLM have proposed eligibility determinations for 69 percent of the properties identified. Approximately 14 percent of identified sites have been determined eligible for listing on the NRHP, 55 percent have been determined not eligible, and 31 percent remain unevaluated.

3) Protection and Evaluation of Unevaluated Properties within the APE:

- a) Powertech will protect all unevaluated properties until an NRHP-eligibility determination is completed, in accordance with 36 CFR § 800.4(c).
- b) If changes in the design or operation of the Project, including wellfield configurations, result in ground disturbance that could affect unevaluated properties, Powertech shall sponsor necessary supplemental research and/or field investigations prior to commencing any ground-disturbance activities. Powertech will provide opportunities for consulting Tribes to help develop a draft investigation methodology for archaeological sites with tribal features and sites identified by the Tribes. The additional studies will provide information to enable NRC and/or BLM, in consultation with consulting Tribes, and the SD SHPO, to make NRHP-eligibility determinations for unevaluated cultural resources.
- c) Powertech must provide a written plan of its investigation methodology (investigation plan) at least four months prior to commencement of work, to enable the NRC and BLM to allocate staff resources for Section 106 reviews; additional review time may be necessary if NRC and BLM staff resources are limited or due to conditions beyond the staff's control.
- d) The NRC will distribute the proposed investigation plan to the 23 consulting Tribes soon after it is received from Powertech.
- e) Upon receipt of the Powertech investigation plan, the NRC, the BLM, consulting Tribes and the SD SHPO will have 30 days to review the proposed plan. The NRC will consider any comments received in writing from consulting parties within the specified review period. If revisions to the plan are necessary, Powertech will revise the plan accordingly and circulate the revised investigation plan to the NRC (or BLM on BLM-administered land). The NRC will forward the revised plan to all consulting parties. A second review period of 30 days may be requested.
- f) Upon approval of the investigation plan by the NRC (or BLM on BLM-administered land), Powertech will conduct supplemental research and/or field investigations and provide recommendations concerning NRHP-eligibility of previously unevaluated cultural resources for NRC consideration. If appropriate, testing will be conducted under the supervision of individuals meeting the Secretary of the Interior's Professional Qualifications Standards. The report shall follow documentation standards outlined in 36 CFR § 800.11.
- g) After the completion of any additional studies, the NRC will submit the findings of NRHP-eligibility evaluation to BLM, SD SHPO, and consulting Tribes, with a 45-day period of review and comment.

- h) The NRC may request revisions to the reports or additional investigations after consideration of comments received from BLM, SD SHPO, and consulting Tribes. The NRC will provide revisions to BLM, SD SHPO, and consulting Tribes, with a 30-day period for a second review and comments.
- i) The NRC will submit final determinations of NRHP-eligibility and effects to SD SHPO for review and concurrence; this review will be completed by the SD SHPO within 30 days.
- j) When the NRC, BLM, and SD SHPO, in consultation with the Tribes, agree on NRHP-eligibility, avoidance will be the preferred option. Avoidance measures may include, but are not limited to, the relocation of pipelines, roads, facilities, monitoring wells, and other disturbances. When avoidance is not possible, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.
- k) If the NRC, BLM, and SD SHPO, in consultation with the Tribes, make the determination that identified cultural resources are not NRHP-eligible, no further review or consideration of the properties will be required under this PA.
- l) When the NRC (or BLM on BLM-administered land) and the SD SHPO disagree on NRHP-eligibility and the disagreement is not resolved through further consultation and the resource cannot be avoided, the NRC will refer the issue to the Keeper of the National Register (Keeper) and request a formal determination of eligibility, in accordance with 36 CFR § 800.4(c)(2). The ACHP may also request referral of an NRHP-eligibility determination to the Keeper.
- m) If a consulting Tribe that attaches religious and cultural significance to a property disagrees with an NRC (or BLM on BLM-administered land) eligibility determination, it may ask the ACHP to request the NRC or BLM to obtain a determination of eligibility from the Keeper in accordance with 36 § 800.4(c)(2).

4) Assessment of Effects:

- a) As part of its consideration of the effects of construction and operations on the landscape, the NRC conducted a line-of-sight analysis to assess the potential for adverse visual effects on all known historic properties located within three miles of the tallest buildings on both the Dewey and Burdock facilities.
- b) The NRC and BLM consulted with SD SHPO and consulting Tribes in making its determination that eligible or unevaluated archaeological sites and properties of religious and cultural significance will be adversely affected by the undertaking. The effects determination is presented in Appendix B Table 1:0.
- c) The NRC and BLM will consult with all consulting parties to develop proposals to resolve these adverse effects (as summarized in Appendix B Table 2:0) in accordance with the process set forth in Stipulation 5—Resolution of Adverse Effects.

5) Resolution of Adverse Effects:

- a) The NRC will solicit suggestions from consulting parties concerning potential measures to avoid, minimize, or mitigate adverse effects on historic properties described in Appendix B after the PA is executed.

- b) The NRC and BLM, in consultation with consulting parties, will determine what treatment measures are appropriate to each adversely affected historic property.
- c) Treatment measures can include, but are not limited to the following:
 - i. For archaeological properties that are significant for their research data potential (Eligibility Criterion D, National Register of Historic Places), the treatment measures may follow standard mitigation through data recovery. Treatment plan(s) for data recovery shall include, at a minimum, a research design with provisions for data recovery and recordation, analysis, reporting, and curation of resulting collection and records, and shall be consistent with the *Secretary of Interior's Standards and Guidelines* (48 FR 44734-44737). Treatment plan(s) must be consistent with easement and permit requirements of other agencies, when applicable. To the extent possible, treatment plan(s) should group related sites and areas, so related resources can be considered in context, and to minimize the burden of review and approval by agencies.
 - ii. Treatment plan(s) for properties eligible under Criteria A, B and C, or significant for values other than their potential research potential shall specify approaches for treatment or mitigation of the property in accordance with the principles, standards, and guidelines appropriate to the resource, if warranted. This may include, but not be limited to, use of such approaches as relocating the historic property, landscaping to reduce visual effects, public interpretation, ethnographic recordation, oral history, archival research, or prescribing use of a component or activity of this undertaking in such a way as to minimize effects to historic properties. Methods of recordation and documentation described in the treatment plan(s) shall conform to the *Secretary of the Interior's Standards for Architectural and Engineering Documentation* (48 FR 44730-44734) or other standards specified by NRC.
 - iii. In lieu of standard mitigation approaches described above, treatment plan(s) may adopt other alternative approaches to avoid, minimize, or mitigate effects to historic properties, including, but not limited to, assisting in the development of Tribal historic preservation plans, developing detailed historic contexts for the region, developing educational materials, purchasing properties containing historic resources, or developing historic property management plans.
- d) Powertech shall prepare a treatment plan for each affected historic property, following the potential treatment measures developed through consultation with all consulting parties,
- e) In conjunction with the submission of their Plan of Activities, which detail construction and operations activities for each year, Powertech will submit one or more draft treatment plans based on input provided by all consulting parties. A draft plan will identify properties that will be affected that year and measures that will be taken to avoid, minimize, or mitigate those effects. A draft treatment plan will be submitted for NRC and BLM review and approval four months prior to construction, so the NRC and BLM can appropriately allocate staff resources to the extent possible; additional time may be necessary in the event that NRC and BLM staff resources are limited due to conditions beyond the staff's control.
 - i. The treatment plan shall contain a description of the effects on each adversely affected historic property and a description of the proposed treatment for each of those historic properties.

- ii. If monitoring by a qualified archaeologist and/or Tribal monitor is part of the strategy for resolving or preventing adverse effects, the treatment plan shall include a Monitoring Plan. The objective of monitoring is to protect known sites from construction impacts, identify at the time of discovery any archaeological materials exposed during ground disturbance, and protect such resources from damage until the procedures for discoveries per Stipulation 9—Unanticipated Discoveries are implemented.
 - iii. If data recovery is determined to be an appropriate treatment and part of the strategy for resolving adverse effects, the treatment plan shall specify all details of the research design, field and laboratory work methodology (including mapping, geomorphological or other specialized studies, controlled scientific excavation methods, analyses of data recovered, and photographic documentation as appropriate), and report preparation.
- f) Upon receipt of a draft treatment plan, the NRC will submit the draft treatment plan to all signatories and consulting Tribes for a 45-day review and comment period. The NRC will consider any comments received in writing from consulting parties within the specified review period.
 - g) The NRC may ask Powertech to revise the draft treatment plan based on comments received from the consulting parties. The NRC will forward revisions to the draft treatment plan and request for a second review by all signatories and consulting Tribes within a 30-day period.
 - h) The NRC will then distribute the final treatment plan to SD SHPO for a 30-day review period, and copies of the plan will be distributed to consulting parties.
 - i) Upon concurrence by the SD SHPO, or if the SD SHPO does not respond in writing within 30 days, the NRC shall direct Powertech to implement the treatment plan.
 - j) If, after consultation, the NRC and the SD SHPO cannot agree on appropriate terms for the treatment plan, the NRC will refer the matter to the ACHP for comment pursuant to Stipulation 14—Dispute Resolution. The NRC will consider ACHP comments in making its final decision on measures to resolve the adverse effects.

6) Future Identification of Cultural Resources for Installation of Power Transmission Lines in Areas to be Determined:

- a) Powertech will notify the NRC and BLM in writing, if it determines that ground-disturbing activities will be required for the installation of electrical transmission lines outside the license boundary. Powertech must provide written notification at least four months prior to commencement of work, to enable the NRC and BLM to allocate staff resources for Section 106 reviews; additional review time may be necessary if NRC and BLM staff resources are limited or due to conditions beyond the staff's control.
- b) Powertech must provide the NRC, the BLM, and the SD SHPO a proposed work plan for a survey to inventory historic properties within the APE for each transmission line as part of the written notification. The plan will include methods for identification of all kinds of cultural properties within the transmission line corridor, including identification of properties of religious

and cultural significance with the involvement of the Tribes. The proposed plan should also include report preparation requirements and schedules for the identification efforts.

- c) The NRC will distribute the proposed work plan to the 23 consulting Tribes soon after it is received from Powertech.
- d) Upon receipt of the proposed Powertech work plan, the NRC, the BLM, consulting Tribes and the SD SHPO will review and provide comments on the plan within 30 days. The NRC will consider any comments received in writing from consulting parties within the specified review period. The NRC may ask Powertech to revise the draft work plan based on comments received from the consulting parties. The NRC will forward the revised plan to all consulting parties. A second review period of 30 days may be requested.
- e) Upon NRC approval of the work plan, Powertech will conduct surveys to identify historic properties along the transmission corridor within an appropriate APE. Powertech will also undertake necessary testing in order to propose NRHP-eligibility of any newly identified properties for NRC consideration. Survey and testing will be conducted under the supervision of individuals meeting the Secretary of the Interior's Professional Qualifications Standards. The report shall follow documentation standards outlined in 36 CFR § 800.11.
- f) Powertech shall offer to provide appropriate financial compensation to Tribal Representatives for the work on the identification of properties of religious and cultural significance. The identification of properties of religious and cultural significance will occur at the same time or prior to identification of archaeological properties.
- g) The NRC will consult with the 23 consulting Tribes on identification of properties of religious and cultural significance. This consultation could include various approaches such as an open site survey opportunity to identify and evaluate places of religious and cultural significance to the Tribes.
- h) Upon receipt of Powertech's completed survey report, the NRC will submit the findings to the BLM, SD SHPO, ACHP, and the consulting Tribes for a review and comment period of 45 days.
- i) The NRC may request revisions to survey reports or additional investigations, after consideration of timely comments made by BLM, SD SHPO, ACHP, and consulting Tribes. The NRC will provide revised documents to BLM, SD SHPO, and Tribes. A second review period of 30 days may be requested.
- j) The NRC will submit final determinations of NRHP-eligibility and effects to the SD SHPO for review and concurrence; this review will be completed within 30 days of the SD SHPO receiving complete information. The NRC will circulate copies of this correspondence to the other consulting parties. The NRC will consider any comments received within the 30-day period.
- k) When the NRC, BLM, and SD SHPO agree evaluated properties are NRHP-eligible, avoidance of the properties will be the preferred option. When avoidance is not possible and adverse effects will result, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.
- l) If the NRC, BLM, and SD SHPO make the determination that identified cultural resources are not eligible for listing on the NRHP, no further review or consideration of the properties will be required under this PA.

- m) When the NRC (or BLM on BLM-administered land) and the SD SHPO disagree on NRHP-eligibility and the disagreement cannot not be resolved through further consultation and avoidance is not an option, the NRC will refer the issue to the Keeper and request a formal determination of eligibility, in accordance with 36 CFR § 800.4(c)(2). The ACHP may also request referral of an NRHP-eligibility determination to the Keeper. The decision of the Keeper will be final.
- n) If a consulting Tribe that attaches religious and cultural significance to a property disagrees with an NRC (or BLM on BLM-administered land) eligibility determination, it may ask the ACHP to request the NRC or BLM to obtain a determination of eligibility from the Keeper in accordance with 36 § 800.4(c)(2).

7) Coordination with Other Federal Reviews:

Any federal agency that will provide approvals or assistance for the undertaking as presently proposed may comply with its Section 106 responsibilities for the undertaking by agreeing to the terms of this PA in writing and sending copies of such written agreement to all the signatories and consulting parties of this PA. Such agreement to the terms of this PA will not necessitate an amendment to the PA.

8) Confidentiality:

The NRC, BLM, and other parties to this agreement acknowledge the need for confidentiality concerning tribal spiritual and cultural information, which was or may be provided to the NRC and BLM during the consultation process. Information provided by consulting tribal representatives, which has been identified as sensitive and was accompanied by a request for confidentiality, will remain confidential to the extent permitted by state and federal laws.

All consulting parties shall restrict disclosure of information concerning the location or other characteristics of historic properties, as well as properties of religious and cultural significance to Tribes, to the fullest extent permitted by law in conformance with Section 304 of the NHPA, South Dakota Codified Laws (SDCL), § 1-20-21.2, Section 9 of the ARPA, and Executive Order on Indian Sacred Sites 13007 (61 FR 26771; May 29, 1996).

9) Unanticipated Discoveries:

In the event a previously unknown cultural resource is discovered during the implementation of the Dewey-Burdock Project, all ground disturbance activities shall halt within 150 feet of the area of discovery to avoid or minimize impacts until the property is evaluated for listing on the NRHP by qualified personnel. The following additional steps shall be taken:

- a) Powertech will notify the NRC, the BLM (if the site is on BLM land), and the SD SHPO of the discovery within 48 hours. Unanticipated discoveries may include artifacts, bone, features, or concentrations of these materials outside previously identified sites, or in and adjacent to previously identified eligible and not eligible sites. Discoveries may also include stones and groups of stones that are out of place in their sedimentary contexts and may be parts of stone features. A “discovery” may also include changes in soil color and texture, or content suspected to be man-made, such as burned soil, ash, or charcoal fragments.

- b) The NRC and BLM (as appropriate) will contact the THPO and/or the Tribal Cultural Resource Office(s) to notify them of an unanticipated discovery soon after notification from Powertech is received.
- c) Powertech will have the discovery evaluated for NRHP eligibility by a professional who meets the Secretary of the Interior's Professional Qualifications Standards in Archaeology (36 CFR § 61).
- d) Powertech will provide results of evaluation and initial eligibility recommendation to the NRC and BLM within ten business days of the discovery. If Tribes want to participate in the evaluation efforts, they should contact Powertech within the specified review period.
- e) The NRC and/or BLM, in consultation with Tribes and other consulting parties, shall evaluate the cultural resources to determine whether they meet the NRHP criteria and request concurrence of the SD SHPO. Evaluation will be carried out as expeditiously as possible, not to exceed 5 business days.
- f) When the NRC, BLM, and SD SHPO agree evaluated properties are NRHP-eligible, avoidance of the properties will be the preferred option. When avoidance is not possible and adverse effects will result, adverse effects will be resolved in accordance with Stipulation 5—Resolution of Adverse Effects.
- g) If the NRC, BLM, and SD SHPO, in consultation with the Tribes, make the determination that identified cultural resources are not eligible for listing on the NRHP, no further review or consideration of the properties will be required under this PA.
- h) Human remains identified during ground disturbance activities will be treated in accordance with Stipulation 10—Human Remains and Appendix D—Treatment of Human Remains on State, Private, and BLM Land.
- i) In the event of unanticipated discovery, Powertech may continue to work in other areas of the site; however, ground disturbance activities shall not resume in the area of discovery until the NRC and BLM have issued a written notice to proceed.

10) Human Remains:

- a) The NRC, BLM, and Powertech recognize human remains, funerary objects, sacred objects, and items of cultural patrimony encountered during ground disturbance activities should be treated with dignity and respect.
- b) Native American human remains, funerary objects, sacred objects, or items of cultural patrimony found on BLM land will be handled according to Section 3 of the Native American Graves Protection and Repatriation Act (NAGPRA) and its implementing regulations (43 CFR § 10). BLM will be responsible for compliance with the provisions of NAGPRA on Federal land.
- c) Native American human remains, funerary objects, sacred objects, or items of cultural patrimony found on state or private land will be handled in accordance with applicable law as described in Appendix D – Treatment of Human Remains on State, Private, and BLM Land.
- d) Non-Native American human remains found on federal, state, or private land will also be treated in accordance with applicable state law.

11) Disposition of Archaeological Collections:

- a) BLM will curate artifacts, materials or records resulting from archaeological identification and mitigation conducted on BLM land at the Billings Curation Center, in accordance with the Billings Curation Center Packaging Requirements in accordance with 36 CFR § 79, “Curation of Federally-Owned and Administered Archaeological Collections.” BLM will consult with Tribes as required by 36 CFR § 79.
- b) Where testing or excavation is conducted on private land, any recovered artifacts remain the property of the landowner. Powertech will return the artifacts to landowners. Powertech will encourage landowners to donate the artifacts to the SD Archaeological Research Center or a Tribal entity, in coordination with the NRC, SHPO, and participating Tribes. Where a property owner declines to accept responsibility for the artifacts and agrees to transfer ownership of the artifacts to SD Archaeological Research Center or Tribal entity, Powertech will assume the cost for curating the artifacts in a facility meeting the requirements of 36 CFR § 79, “Curation of Federally-Owned and Administered Archaeological Collections.”

12) Qualifications:

The identification, evaluation, and mitigation of historic properties carried out pursuant to this PA shall be performed by or under the direct supervision of qualified individuals in the appropriate historic preservation discipline meeting, at a minimum, the appropriate standards set forth in 36 CFR § 61.

In recognition of the special expertise Tribal experts have concerning properties of religious and cultural significance, the standards of 36 CFR § 61 will not apply to knowledgeable, designated tribal representatives carrying out identification and evaluation efforts for properties of religious and cultural significance to Tribes.

13) Compliance Monitoring:

NRC affirms avoidance of adverse effects to historic properties remains the preferred course of action.

- a) Powertech will ensure employees and/or contractors involved in all phases of the Project are aware of and comply with the requirements of the PA. Powertech may use measures such as initial orientation training, as well as pre-job briefings to inform employees and contractors of their responsibilities under the PA. Compliance with this PA is a condition of the NRC license and a condition of the BLM Plan of Operations.
- b) Prior to initiating construction activities, Powertech will develop a Monitoring Plan specific to the project, identifying specific areas, activities, and if appropriate, historic properties that require monitoring during development of the Project, ensuring the requirements of this PA and the treatment plans developed under the provisions of Stipulation 5—Resolution of Adverse Effects are met. The monitoring plan will include provisions for annual reporting of the results of the monitoring program to the signatories and the consulting Tribes to this PA.
 - i. Powertech will provide the Monitoring Plan to the NRC, which will distribute it to the signatories and consulting Tribes to this agreement for a 30-day review and comment period.

- ii. The NRC will request that Powertech make any necessary revisions to the plan, and the revised Monitoring Plan will remain in effect for all covered ground-disturbing activities during the license period.
- c) Powertech will engage the services of a Monitor with specific responsibilities to coordinate the requirements of the monitoring plan, the treatment plans, and this agreement during project construction.
 - i. The Monitor will meet the Secretary of the Interior's Professional Qualifications for Archaeology. Preference will be given to individuals meeting those qualifications who are employed by tribal enterprises, especially during phases of the monitoring program where sites with religious and cultural significance to the Tribes might be affected. In the case of an unanticipated discovery or imminent threat to a historic property (for which avoidance had been planned), the Monitor shall have authority to stop certain construction activities.
 - ii. The Monitor will coordinate with Powertech and its contractors during the construction phases of the Project.
- d) Powertech will provide periodic updates to all consulting parties on the status of the monitoring program as specified in Appendix C.

14) Dispute Resolution:

Should any signatory to this PA object in writing to any actions proposed or to the manner in which terms of the PA are implemented, the NRC shall consult with the party to resolve the objection. If the NRC determines the objection cannot be resolved, the NRC will:

- a) Forward all documentation relevant to the dispute, including the NRC proposed resolution, to the ACHP and send a copy to all other consulting parties. The ACHP shall provide NRC with its advice on the resolution of the objection within 30 days of receiving adequate documentation. Prior to reaching a final decision on the dispute, NRC shall prepare a written response that takes into account timely advice or comments regarding the dispute from the ACHP, signatories, concurring parties, and consulting parties, and provide a copy of this written response to them. NRC will then proceed according to its final decision.
- b) If the ACHP does not provide its advice regarding the dispute within the 30-day period, the NRC may make a final decision on the dispute and proceed accordingly. Prior to reaching a final decision, NRC shall prepare a written response that takes into account timely comments regarding the dispute from the signatories, concurring parties, and consulting parties, and provide them and the ACHP with a copy of such written response.
- c) NRC responsibilities under this Agreement, which are not the subject of the dispute, shall remain unchanged.

15) Amendment:

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

Concurring parties will be provided an opportunity to consult and comment on the proposed amendment. An amendment will be effective on the date the amended PA is signed by all of the signatories to this PA. If a required signatory does not sign the amended PA, the amendment will be void. The amendment shall be appended to this PA as an Appendix.

16) Termination:

- a) If any signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment to the PA pursuant to Stipulation 15—Amendment. If within 30-days (or another period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the PA upon written notification to the other signatories.
- b) If this PA is terminated the NRC shall either (i) execute a new PA pursuant to 36 CFR § 800.6(c)(8) with signatories as defined in Section 800.6 (c)(1) of Title 36 or, (ii) the NRC shall request comments, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7(c)(4). NRC shall notify the signatories as to the course of action it will pursue.
- c) After the termination of this PA and until the NRC completes consultation and a new PA is executed or the NRC has requested, taken into account, and responded to the comments of the ACHP under 36 CFR § 800.7(c)(4), Powertech is required to follow the terms and conditions of this PA for current ground-disturbing activities and is not permitted to begin any such activities in new areas.
- d) If the terms of this PA are satisfied prior to its expiration date, NRC shall provide written notification to the other signatories and consulting parties to close out this agreement.

17) Duration:

This PA shall remain in effect for 10 years from its date of execution (last date of signature), or until completion of the work stipulated, whichever comes first, unless extended by agreement among the signatories. During the effective period and prior to the expiration of the PA, the NRC may consult with the signatories and concurring parties to amend this stipulation to extend the duration of the PA, in accordance with Stipulation 15—Amendment.

18) Anti-Deficiency Act:

The stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act (Pub.L. 97–258, 96 Stat. 923; 31 U.S.C. §1341, Limitations on expending and obligating amounts). If compliance with the Anti-Deficiency Act alters or impairs the ability of the NRC to implement this Agreement, the NRC will consult in accordance with the amendment and termination procedures in this Agreement.

Execution of this PA by the NRC, BLM, SD SHPO, ACHP, and Powertech and the implementation of its terms is evidence the NRC and BLM have taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

This PA may be executed in counterparts, each of which shall constitute an original, and all of which shall constitute one and the same agreement.